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INDIA RUBBER WORLD

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Stability of Ficus Elastica Latex[1]

F. K. Daniel, H. Freundlich, and K. Söllner

THANKS to the kind endeavors of E. Hoyle (Revertex, Ltd.) of Rengam Estate and to the support given by Mr. Simpson, manager of Rim Estate, we obtained a sample of 2.7 liters of Ficus elastica latex. The latex had been collected at Rim Estate, Malacca, on two successive days from about 10 trees which had not been tapped since 1912. Ammonia was added to the latex in such a quantity that about 700 milliequivalents per liter of free ammonia were present; methyl red was used as the indicator. The dry matter (T.S.) and dry rubber content (D.R.C.) estimations were T.S.=38.8%, D.R.C.=36.5%.

Stability of Fresh and Preserved Latex

In his report attached to the sample Mr. Hoyle writes: " . . . we used the 'Herringbone' tapping to obtain the latex as quickly as possible. Latex oozed on to the tapping cut freely at first, for a minute or two, but quickly thickened and became apparently half coagulated. Addition of ammonia solution to the tapping cuts did not help the flow appreciably, but addition of ammonia to the latex in the cups during dripping of the trees greatly reduced the viscosity of the latex and minimized the amount of coagulum to be strained off. Hevea brasiliensis trees which have been resting for some months, or which are freshly opened-up, also yield only a small quantity of highly viscous latex at first. With the Ficus elastica trees, the cuts made on November 1, 1935, were reopened the next day, but the flow of the latex was then, if anything, worse than on the first day. . . . "

This means that the latex is very unstable at the time it leaves the tree, and that this is so regardless of the time interval between tappings.

We confirmed statements in the literature[2] that this latex when containing ammonia is very stable; when testing our sample seven weeks after tapping we found that it no longer had a tendency to be coagulated either spontaneously or by the addition of other substances; on the contrary, it was very difficult to coagulate at all, the addition of electrolytes causing only microscopic aggregation and creaming. The cream readily redispersed on shaking.

Improvement of Stability upon Aging

From this peculiar change we must conclude that a protecting substance had been formed within the latex after tapping. From a study of Hevea and Jelutong latex we know that important changes can take place in the latex outside of the tree, and as a rule a decrease in stability is observed. The increase in stability occurring in Ficus latex was not due to a change of the rubber hydrocarbon as in the case of Jelutong latex, for the quantity and the quality of the Ficus rubber were absolutely unchanged after ten months. A change in the resins, which are present in the latex to a noticeable amount, appears to be the most probable explanation; also this change was very likely due to the NH_3 added.

Two reactions of the NH_3 may be foreseen. It may neutralize instantaneously the resinic acids which are present in the freshly tapped latex, forming resin soaps; or it may slowly saponify to a further extent the resin esters, which may constitute the largest part of the resins in Ficus latex. The first reaction would account for the improved stability of the latex after the addition of NH_3. It is not sufficient, however, to explain why in course of time the latex becomes so stable that it does not return to its original instability when it is acidified. In the case of the second reaction the derivatives of resin esters, produced by the saponification of higher esters, are probably capable of exercising a protecting action even in an acid medium.

We may see a confirmation of this assumption in the fact that the reactions going on in the latex occur without

[1] The experimental work described in this paper was performed during 1936 in the Deparment of Chemistry of University College, London, England. The authors sincerely thank Revertex, Ltd., London, for its kind help.

[2] E. A. Hauser, "Latex," (Translated by W. J. Kelly), 1930, pp. 47, 76.

consumption of oxygen, but with consumption of considerable amounts of NH_3. This is in contrast to the reaction going on in Jelutong latex, which we found to be an enzymatic process of oxidation.[3]

Reduction in NH_3 Content

Experiments were conducted to determine the consumption of NH_3 in Ficus latex. The NH_3 content of undiluted Ficus latex previously sealed in airtight containers was determined by neutralizing with normal HCl, using methyl red as an indicator. The NH_3 content decreased from 700 milliequivalents per liter to only 360 after three months. The effect of elevated temperatures on the rate of NH_3 consumption was also determined. Three carefully sealed test tubes containing latex diluted with water in the ratio of one to two were held for 12 days at different temperatures: room temperature, 40° C. and about 90° C. respectively; the NH_3 content was then determined. The room temperature sample required about 320 milliequivalents per liter of HCl to be neutralized; the 40° C. sample, about 280; and the 90° C. sample, 230. The results of this experiment suggest that we are dealing with a purely chemical reaction: if bacteria or enzymes were involved in the process, we ought to find a decrease in the consumption of NH_3 at 90° C. Obviously then the reaction is not due to an enzymatic process of oxidation similar to the one occurring in Jelutong latex.

Behavior upon Neutralization

If alkaline Ficus latex is neutralized with acid, i.e., if its particles are discharged, aggregates are formed which cream quickly. Referring to the last mentioned experiment above, the sample held at room temperature creamed most quickly and completely; the 40° C. sample creamed only partly, the creaming process requiring more time than in the first case; the 90° C. sample behaved like the 40° C. sample, but to a more pronounced degree. This apparently proves that increased saponification really causes increased protection of the particles; this implies that the protecting action is produced by substances formed during the reaction.

From a qualitative point of view there is no objection to assuming that NH_3 reacts in neutralizing resinic acids and saponifying resin esters, but from a quantitative point of view it appears unlikely that such a large quantity of NH_3 (nearly 400 milliequivalents per liter) should be consumed by these reactions alone. There are probably other reactions proceeding at the same time; for instance the breaking up of sugars present in the latex. It is known from a study of Hevea latex that large amounts of NH_3 are consumed by the splitting of sugars in the alkaline medium. Furthermore, alkaline solutions of pure sugar, held in an atmosphere where the oxygen is not renewed, turn yellow and brown in course of time,[4] as did the serum of our Ficus latex.

Nature of Ficus Latex Particles

Like the resins in the Hevea species investigated by Frey-Wyssling[5] and unlike those of Jelutong latex,[6] the bulk of the resins in Ficus latex appears to be present in the form of individual particles, clearly distinct from the rubber hydrocarbon particles. There are, in any case, two different kinds of particles present in Ficus latex. Creaming always produces a deep upper layer, pink in color, and a lower layer of less depth and white in color. The latter is formed much slower than the former and can be observed only after the latex has creamed completely. Microscopically the particles of the two layers cannot be distinguished; both are about one micron to two microns in diameter. (Particles up to five microns mentioned in the literature[7] were not present in our sample.) By removing and drying the upper layer, a rubber skin of very good properties (nearly like those of a vulcanized Hevea rubber) was obtained. The lower layer treated in the same way gave a product which is hard and only slightly elastic at room temperature; at higher temperatures it becomes sticky and plastic, having the odor of the warm Jelutong resins. This product was partially soluble in warm acetone. Hence there is little doubt that the heavier particles from the white layer consist in part of resins.

Effect of H_2O_2

According to statements in the literature,[7] Ficus latex is not pink, but white, when leaving the tree, and only becomes colored when exposed to light or air for some time. Mr. Hoyle observed that on adding ammonia to fresh (white) latex, the latex instantly turns yellow at the point where the ammonia is introduced. We found that old Ficus latex is quickly decolorized by H_2O_2, and when left in contact with it for several weeks, a part of the creamed latex particles becomes yellow. H_2O_2, however, does not destroy the substance protecting the particles of Ficus latex, as is the case in Jelutong latex; upon heating the mixture of latex and H_2O_2 and adding acetic acid the latex was coagulated no more than in the case of a similarly treated latex without H_2O_2. At room temperature no difference in coagulation was noticed.

Properties of Protective Substance

This H_2O_2 experiment again proved that the protecting substance of Ficus is different from that of Jelutong latex. The experiment below showed that it is also quite different from the protective agent of Abiarana Gutta Percha latex. When the serum of Ficus was added to Hevea latex, the latter was not found to be protected against coagulation by electrolytes as is the case when Abiarana serum is added to Hevea latex. This indicates that the Ficus rubber particles must have adsorbed all of the protecting substance irreversibly, or that the part not adsorbed on the particles must have been contained in the serum as a colloidal dispersion like the rubber particles themselves. The protective substance, therefore, could not be adsorbed as a protecting layer on the Hevea rubber particles.

The protecting substance is, in any case, not dissolved in the serum, as is brought out below. Washing Ficus latex caused reversible aggregation, as in the case of the addition of electrolytes, instead of coagulation. This fact proves that the protective agent cannot be removed by washing and therefore is not water soluble.

Under the influence of an electric current, serum-free Ficus particles that had been suspended in water, being negatively charged (but not ampholytic like Abiarana and Hevea particles), migrated to the anode where they were deposited in the form of a layer. As this layer could be removed by a jet of water, disintegrating into single particles or small aggregates, the layer could not consist of coagulated particles. Thus Ficus particles differ in this respect from poorly protected rubber particles in general such as Hevea and washed Abiarana particles which

[3] F. K. Daniel, H. Freundlich, K. Söllner, India Rubber World, Feb. 1, 1938, p. 49.
[4] H. Schade, *Z. ph. Ch.*, 54, 1 (1906).
[5] A. Frey-Wyssling, *Medellel. Algem. Proefst. AVROS*, 13, 7 (1929).
[6] F. K. Daniel, H. Freundlich, K. Söllner, India Rubber World, Feb. 1, 1938, p. 49.
[7] E. A. Hauser, "Latex," p. 76.

HEVEA BRASILIENSIS	ABIARANA GUTTA PERCHA	FICUS ELASTICA	JELUTONG
Latex Stability			
Is coagulated spontaneously in a few hours without preservatives. Even with NH_3 the stability is only limited.	Stable without preservatives for many months. Stability not altered despite the fact that other substances in the serum are decomposed in course of time, causing the latex to become acid.	Highly unstable when leaving the tree. Very stable after NH_3 is added.	Unstable without preservatives. Very stable if alkali has been added.
Stabilizing Agents			
Proteins are most probably the substance responsible for the stability and other colloidal properties. The latex behaves like a protein suspension.	Natural stabilizing substance is distributed between the serum and the particles in a reversible adsorption equilibrium. May be washed out and stabilizes, for instance, Hevea latex when added to it.	Protecting agent is adsorbed irreversibly, it cannot be washed out and does not protect unstable latices, like the substance in Abiarana does. Resins are an important foreign substance. They presumably form the stabilizing agent when reacting with NH_3.	Behavior similar to that of Ficus, except that it is not equally stable. Chemical nature of protecting substance unknown; it is destroyed probably when reacting with H_2O_2.
Behavior toward Electrolytes			
Is coagulated readily to a lump of rubber when electrolytes are added.	Is not coagulated when electrolytes are added; the particles only cream and are redispersed on shaking.	Behaves like Abiarana.	Is coagulated in about 24 hours when electrolytes are added.
Behavior toward H_2O_2 and Boiling			
Is not coagulated on being boiled or by H_2O_2.	Behaves like Hevea.	Is coagulated on being boiled, but not by H_2O_2.	Is coagulated on boiling only if H_2O_2 has been added.
Behavior under Influence of an Electric Current			
Particles deposited by an electric current on the anode form a coherent skin.	Particles deposited by an electric current on the anode form a thin layer which can easily be redispersed.	Particles deposited by the electric current on the anode form a layer thicker than in the case of Abiarana, which can be redispersed by a jet of water.	Particles are partly deposited on the anode by an electric current; they do not form a coherent skin, but sticky little lumps.
Ampholytic Behavior			
Ampholytic system: Isoelectric point about pH—4.8. Ampholytic behavior due to proteins.	Ampholytic system. Isoelectric point about pH—4.3 Ampholytic behavior probably due to a protecting agent, which is very likely a glucoside of high molecular weight.	System not ampholytic.	System not ampholytic.
Density of Particles and Coagulum			
Particles and coagulum are lighter than the serum; they cream.	Particles and coagulum are lighter than the serum; they cream.	Particles all cream, but they are fractionated to a certain extent to a lighter and heavier layer.	Particles and coagulum are heavier than the serum. They both settle down.
Particle Types			
Small percentage of resinous particles is to be seen independent of the rubber particles.		Two types of particles: lighter particles containing more rubber, and heavier particles containing more resinous matter.	Only one type of particles. Each particle contains both rubber and resinous substance. Resins are present in excess (20% against 5% rubber).
Decomposition Reactions			
		When interacting with light or air or both, the latex soon turns pink. H_2O_2 decolorizes it Color perhaps due to alkaline decomposition of sugars.	Rubber is transformed in course of time into a resinous substance, if air is admitted. This decomposition appears to be an enzymatic reaction.
Emulsifying Property			
		Contains from the beginning substances which favor the emulsification of organic liquids (butyl-alcohol, etc.) in the latex. The substance is probably a soap-like compound, formed by the reaction of NH_3 on the resins.	When the latex is oxidized in course of time, a substance is formed, favoring the emulsification of organic liquids, as in the case of Ficus. This is probably also a soap-like substance, produced by the reaction of a resinous substance with the alkali.

(*Continued on page* 38)

Zinc Sulphide for White Compounds

ZINC sulphide, one of the strongest whitening agents known, was first made commercially in the United States by the New Jersey Zinc Co. in 1924. At this time the prevailing price of zinc sulphide, most of which was imported from Germany, was $1 per pound, and its use in rubber was limited to dentures. In the course of the past 14 years expanding volume resulting from increased uses made it possible to reduce the price gradually to the present level of 8⅜¢ per pound. As zinc sulphide has a specific gravity of 3.92, the present volume cost (based on 8⅜¢ per pound) is slightly less than that of zinc oxide (based on 6¼¢ per pound).

Comparative Whitening Power

Zinc sulphide is exceeded in whitening power only by pure titanium dioxide. The relative whitening power of zinc sulphide and titanium dioxide varies considerably, depending on the particular compound in which the tests are conducted. Deribere[1] reported that 11% of titanium dioxide will give the same tinting power as 20% of zinc sulphide. The zinc sulphide was not specifically identified, and the compound used in arriving at this result was not given.

Whitening strength is closely related to refractive index. Deribere gave the following values of refractive index for white pigments in relation to air. The refractive index of rubber is also given for reference.

TiO_2 (98%)	2.60
Blanc Fixe	1.65
Zinc Oxide	1.90
Antimony Oxide	2.29
Zinc Sulphide	2.30
Rubber	1.52

Improvement in Zinc Sulphide

In the past two years especially, the whitening power of zinc sulphide has been increased considerably. This improvement, which has resulted from a fuller realization of the inherent optical properties of the pigment, has been noted successively in Cryptone ZS-20, Cryptone ZS-86, and Cryptone ZS-230, products of the New Jersey Zinc Co., 160 Front St., New York, N. Y. Crytone ZS-230, a recent development, is a technically pure zinc sulphide and may be expected eventually to replace the other Cryptone zinc sulphides because of improved color, brightness, and whitening power. Crytone zinc sulphide for use in rubber industry is required to meet a minimum standard for light reflectivity as measured by an instrument to be described in a future issue of INDIA RUBBER WORLD.

Cryptone ZS-230 has an average particle size of 0.30-micron and for equal volume loadings gives stress-strain properties approaching that of XX Red-4 Zinc Oxide. In comparison with zinc oxide, however, it is somewhat deficient in respect to resistance to tear and abrasion.

Zinc sulphide does not activate organic accelerators. The aging properties of compounds containing zinc sulphide are considered to be satisfactory, and this is especially true of compounds vulcanized with sulphur chloride. Zinc sulphide is a pigment of soft texture, a property which is reflected in the smooth processing behavior of its rubber compounds.

Application

Zinc sulphide is one of the few materials which may be used in hard rubber without seriously impairing the physical properties of the resulting compounds. In low loadings it is said actually to improve impact strength. Probably the earliest application of zinc sulphide in the rubber industry was a constituent of denture compounds, a use that has been extended to other white or tinted hard rubber products.

The most extensive use of zinc sulphide is in white or tinted soft rubber compounds. For white sidewall tires it is always used in conjunction with zinc oxide. One of the best compounds from the standpoint of resistance to discoloration and sun checking has been found to consist of 15 volumes of a special zinc oxide for color (XX Red-203) and 10 volumes of zinc sulphide.

Zinc sulphide is also used in white footwear, heels, and soles, rubber coated fabrics, sheeting, and thread compounds. Because it dulls the cutting knives less than other high-strength pigments, zinc sulphide is used in cut thread stocks. Superior aging with sulphur chloride cures indicates its use for this purpose.

In latex compounding, zinc sulphide is of increasing interest. It is readily dispersed and produces very stable suspensions. Also zinc sulphide appears to have a whitening strength in latex compounds comparable to titanium dioxide on an equal weight basis, which, of course, is not the case in dry rubber compounds.

[1] M. Deribere, *Caoutchouc & gutta-percha*, 33, 17525 (1936).

Carbon Black in '37

The carbon black industry in 1937, the Bureau of Mines reported, featured three highlights: production gains, increased total sales, and a slump in prices the latter part of the year. Production reached 510,606,000 pounds, 24% more than the record of '36. When the rubber industry in the latter part of 1937 experienced a decline, carbon black sales dropped so that producers' stocks gained: 100,497,000 pounds at the end of 1937, against 79,582,000 pounds at the close of 1936.

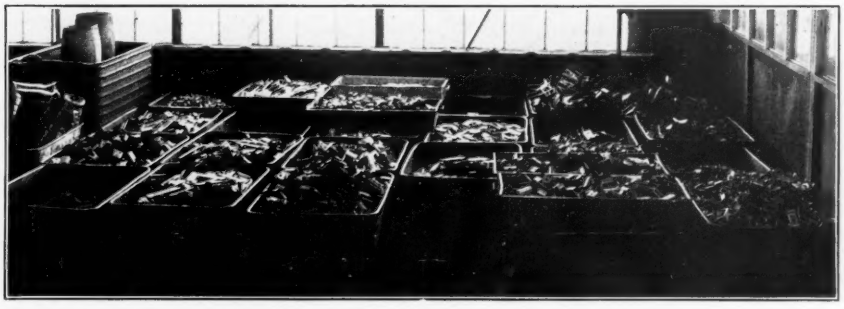
Production rises were recorded by all producing states. The Texas Panhandle again produced nearly 80% of the total. For the first time Kansas entered the field. Last year 341,085,000,000 cubic feet of natural gas were burned at 57 carbon black plants, against 283,421,000,000 cubic feet at 54 plants in 1936, or about 14% of the estimated gas consumption in the U. S. in 1937, contrasted with 13% in '36.

Adhesion of Rubber to Metal[1]

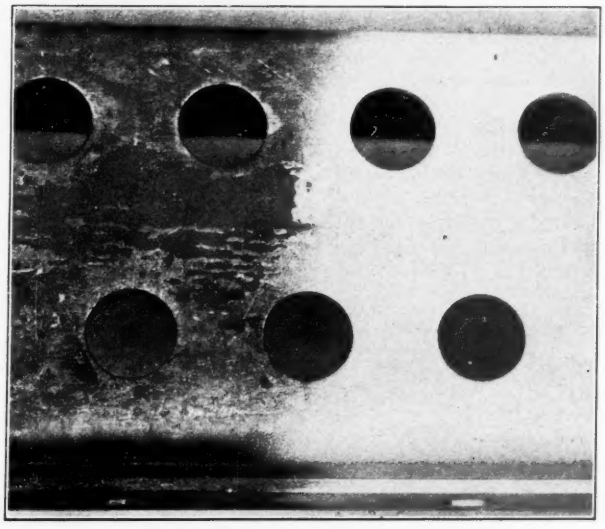
The Brass Plating Method

J. D. Morron[2]

DURING the past five or ten years knowledge relating to the adhesion of rubber to metal has advanced considerably, so much, in fact, that this type of process has been looked upon as a new and distinct forward step in rubber technology. However upon a casual review of the literature, particularly patent literature, the newness of this development is not readily apparent; patents and patented processes have been found that date back to the early days of the industry. For the most part these earlier processes are unsatisfactory for modern engineering purposes, and the wide application possible today has been due to recent intensive research, which has resulted in a vastly superior type of adhesion.



Metal Stampings before Brass Plating



Effect of Sandblast Cleaning on Metal: *Left* Shows Condition before Treatment; *Right* Shows Cleaned Surface

Early Processes

One method which has been used from the early days until the present is the use of a hard rubber base between the soft rubber and the metal. This process, in addition to requiring long cures, introduces a substantial layer of hard stock which limits the physical characteristics of the rubber-metal parts. Also, the process is expensive and troublesome.

With the exception of hard rubber, most of the early references to methods of adhesion are vague as to the quality of adhesion obtained. Judging from attempts to repeat these early processes, and some not so early, one is led to believe that any process resulting in a product which did not fall apart from the weight of one of its components was hopefully described and entered in the patent office. Among these less satisfactory methods were: sulphur chloride, copper sulphate bath, and many complicated processes for plating with copper and brass alloys. Most of the alloy processes described were rendered intriguingly mysterious by adding to the copper and zinc other elements which were supposed to produce the desired results. In view of later experience with brass it seems unquestionable that most of the positive results were of an accidental nature and were obtained when conditions happened to be just right. The added materials probably had little or no effect on the results. Little attention was apparently paid to the composition of the rubber stock.

Adhesion by Cements

Today there are a great many processes patented for obtaining rubber to metal adhesion, the largest part of which are worthless as a commercial possibility since the adhesion obtained is of a low grade. The present paper will briefly cover cement techniques and then discuss the brass plating method in greater detail.

Important advances have been made in perfecting cements which will give good adhesion. These cements have come into extensive use for large-size structures which cannot be easily handled by the plating method. Upon superficial examination many of these cement processes seem so simple that the tendency has been to disregard the possibility of plating. On special large parts or in the case of limited quantities, cementing undoubtedly offers great possibilities, especially in view of the fact that the equipment for plating is expensive. However, where there are thousands of parts being made every day, it will

[1] Paper presented at the spring meeting of the Rubber Division, American Chemical Society, Detroit, Mich., Mar. 29.

[2] Manager, Motor Products Development, United States Rubber Products, Inc., Detroit.

be found that the plating process is relatively simple when compared with most of the cement techniques.

Cementing methods almost invariably require very careful control over the drying time and the application of the rubber stock to the cemented object within narrow ranges of time. In the laboratory or under conditions existing where a limited quantity of parts are being processed, such technique is perfectly possible; but in a plant where the normal 24 hours' production consists of several hundred thousands of parts, it is very difficult to use such close control. Moreover many cements are thermoplastic at molding temperatures and do not give good adhesion at the edges. Adhesion by means of brass plate, on the other hand, is not thermoplastic and gives good adhesion at all points.

The Brass Plating Method

The author's experience with the brass plating method extends back to 1923 when this process was used for adhering rubber to metal pulleys. While the demand for this product did not materialize into a great volume of business, the type of adhesion obtained did arouse the interest of men in the automotive industry.

In the plating process the main difficulty is to obtain a brass plate of the correct composition. After this is once obtained, the rest of the processing is comparatively simple. In general, except under very specific weather conditions, it is possible to carry out the vulcanization at any time within 48 to 72 hours (in some cases, a week or more) after plating without fear of faulty adhesion.

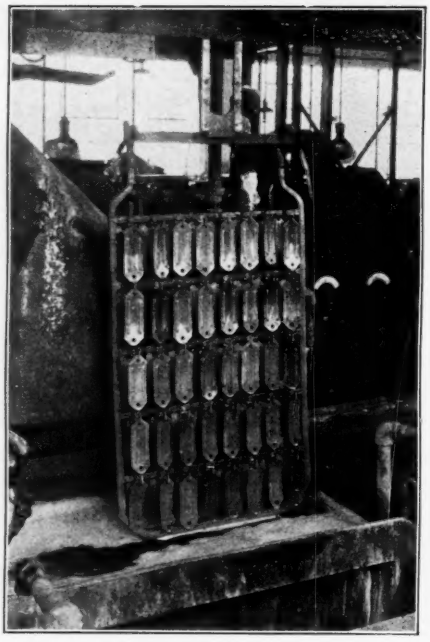
Satisfactory adhesion of rubber to metal with the brass plating process depends upon four factors: (1) proper selection of the metal to be brass plated; (2) proper quality of the plating to the metal; (3) proper compounding of the rubber stocks for adhesion to the plating; and (4) the correct process control throughout.

Composition of Brass and Base Metal

To obtain a brass plate of a definite composition from day to day is an important consideration. Although the brass used for this purpose may vary from 65 to 85% copper (35 to 15% zinc), general practice is to use a brass with 70% copper. The type of brass adopted will influence the compounding of the rubber stock.

It has been found that S.A.E. 1010 hot rolled steel is particularly desirable as a base metal. However steel of various carbon contents, cast iron, and many alloys can be plated. Stainless steels cannot be accepted for adhesion work without preliminary testing; as a rule the higher the manganese and chromium content, the greater is the difficulty in obtaining satisfactory adhesion. Most materials with the exception of magnesium alloys can be plated for adhesion, but in general special procedures are necessary both for plating and in preparation of the metal for plating. Therefore the volume of plating must be sufficient to warrant the cost of the special equipment necessary.

Although adhesion may be obtained with cold rolled steel, the type of bond obtained is generally unreliable owing to the smooth, fine-grained surface. Metals with heavy scale which cannot be easily removed are objectionable; case-hardened metals also require extra care. It must, of course, be recognized that it is as necessary to get as good a bond between the base metal and the plate as between the plate and the rubber.



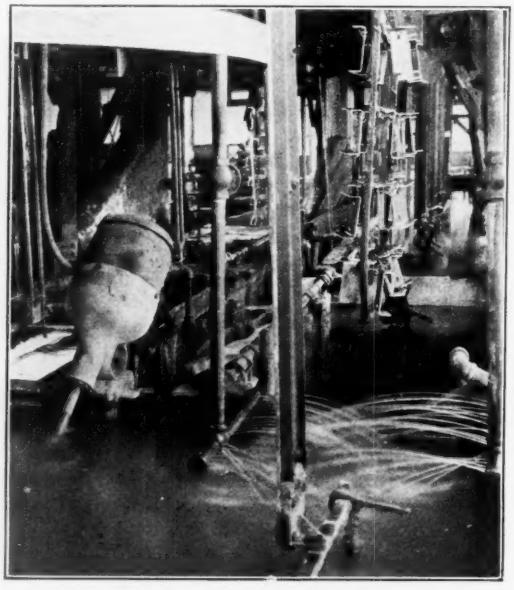
Metal Parts on Rack Being Lowered into Pickling Solution

Preparation of Base Metal

In any plating process the metal must be treated so that a clean surface is presented for plating. Pickling is the preferable cleaning method, but where heavy scale is present, sandblasting is necessary. The preparation and plating processes described below are carried out entirely on automatic equipment.

If the base metal is covered with excessive dirt, heavy grease, or oil, preliminary cleaning may be necessary. The larger amount (approximately 95%) of the metal to be treated, which contains only the normal amount of oil and grease and has only a slightly rusty coating or light scale, can be placed directly on the cleaning and plating line.

The first step which removes all of the grease and loose dirt is immersion for four minutes in an electrolyzed alkali cleaning bath. After rinsing, the metal is given an electrolyzed acid pickle of two minutes, which removes rust and light scale; a light layer of carbon is deposited on the surface, which is also slightly etched by the acid. This carbon is next removed by an electrolyzed caustic bath.



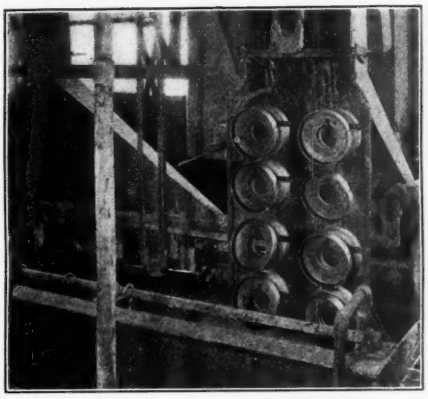
General View of Plating Machine; Large Rack Operates Automatically on Overhead Conveyer to Carry Parts through the Line of Tanks and to Provide Emersion for a Predetermined Period

Plating

After a thorough wash the metal is given a "strike," a flash plate of copper, and then placed in the brass plating bath where

it remains for 20 minutes. The bath, which is kept at room temperature, utilizes a solution of the usual copper-zinc ratio, (four to one) with not over four ounces of metal per gallon of plating solution; the free cyanide is carefully controlled. The anodes are 80% copper and 20% zinc; while the current density is 2½ to 5 amperes per square feet of surface. It is necessary from time to time to replenish the bath with copper and zinc salts and sodium cyanide.

Control is essential to successful plating; thus the correct composition of deposit and also the correct structure and surface condition are assured. Experienced men can quickly detect differences in the appearance of the plate which will reflect in the type of adhesion obtained. A daily analysis of the brass plating bath and the plate is considered necessary to assure uniformity.



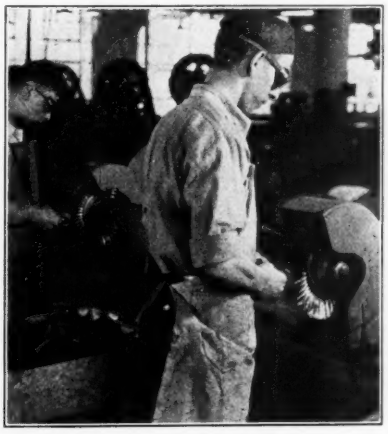
Metal Parts Entering a Plating Tank

Spraying Cement on Metal Parts

After 15 years of experience with brass plating during which time we probably have encountered all of the possible difficulties, production is now continuous on a 24-hour-day basis without any interruptions except for renewing solutions. To enumerate all of the difficulties which can happen to a plating bath would require much space.

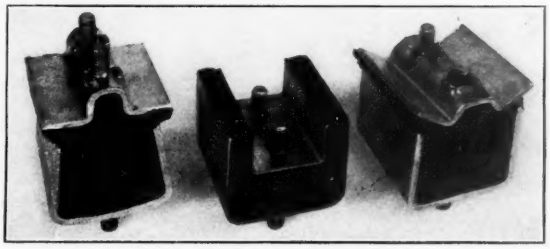
If the bath is of such a nature that equilibrium changes rapidly, hardly any two deposits will have the same composition or appearance. Large tanks are preferable to small ones as changes in the solution take place more slowly. Automatic equipment also promotes uniformity of plating.

Sludge consisting of carbonates, various iron compounds, dirt, etc. gradually accumulates in the plating bath and should be settled out at frequent intervals. We have also adopted a policy of throwing out the solution once a year and starting out fresh. This may sound wasteful, but the increased defects caused by plating in an old solution would soon result in a much greater loss than the actual value of the solution.



Buffing Mold Flash from Rubber Mountings

Spotting out, a form of stain which often appears when the brass is exposed to hot humid atmosphere, is a major difficulty and has not been completely overcome. Spotting out occurs rapidly; in a few minutes a piece of brass can become covered with dark brown stains which completely destroy adhesion. Spotting is not generally serious in hot dry weather or cold wet weather, but with a combination of a hot and damp atmosphere spotting is likely to result. To counteract this it has been found advisable to keep the free cyanide content high and reduce the time interval between brass plating and application of the rubber.



Mountings before and after Olsen Test: *Center*, A Mounting before Testing; *Left and Right*, Mountings after Testing

Rubber Compounding

Rubber compounding is done in the usual way, and the compounds should be kept free from dirt, dust, and bloom. The cleaner the surface applied to the brass, the better is the adhesion.

When compounding for adhesion it is difficult to establish specific directions, but the following guiding facts will suggest the general procedure to use: (1) the rubber should be well broken-down; (2) the sulphur should be at least from 2 to 3%; (3) accelerators which are definitely advantageous are hexamethylene tetramine, D.O.T.G., and Captax and some of its derivatives such as Altax, O.X.A.F., Zenite, Ureka C, also, D.P.G. plus magnesia, (accelerators which have been found to be definitely negative are Tuads, Monex, litharge, No. 808, Heptene, and super-accelerators in general); (4) it is advantageous to use comparatively high cures, from 60 pounds' steam pressure up; (5) reenforcing pigments such as zinc oxide and carbon black have a positive effect; (6) reclaims are used in some adhesive stocks, and while the best results have been obtained with whole tire reclaim, it is probable that the effect of the reclaim depends largely upon the organic softeners contained in the reclaim; (7) excessive amounts of softeners may cause poor adhesion because of their tendency to retard the reaction of the sulphur with the brass or cause it to bloom to the surface of the raw stock, thus presenting an unclean surface; it has also been found that stocks with excessive amounts of softeners will affect the adhesion where an adhesive cement has been utilized, which result is probably due to the migration of the softener into the cement; (8) pine tar, Laurex, stearic acid, light rose neutral oil, and B.R.T. No. 7 have been successfully used as softeners; (9) in general, highly compounded stocks adhere more firmly than soft gummy stocks, a hardness range of from 50 to 75 (durometer) giving the best results.

Attaching the Rubber to the Metal

In general, the brass is first sprayed with a coat of rubber cement, especially compounded to give high adhesion to rubber. In many instances the stock is then built up directly upon the cemented brass. In some cases, however, where the flow of stock in molding will tend to loosen or force the cement from the metal, it is necessary to place a thin coating of plastic cement-stock on the rubber before molding.

The prepared parts should be kept clean and be molded as soon as possible. As far as possible the molds should be designed to give pressure perpendicular to the adhesion surface. Also they should provide for building up a high internal pressure and not allow too great a displacement of the stock in molding. After vulcanizing, the flash is easily removed with wire brushes, and, in some cases, where service requirements indicate, the molded part is dipped in oil-resisting lacquer

Degree of Adhesion Obtained

Specifications generally require adhesion of 200 to 250 pounds per square inch. Average production articles in our factory test 500 to 600 pounds per square inch, and frequently as high as 1,000 pounds per square inch. In practically all tests of finished goods the metal is completely distorted before the bond is broken, and in many cases the assembly bolts will pull through the metal with the adhesion still intact. One of the most important requirements is that there should be no separation at the edges. Most specifications state that the rubber should not be pulled back more than 1/16-inch for a space not over ½-inch in length.

In the beginning of modern adhesion by brass plating these specifications seemed almost unreasonably severe. However insistence by automobile companies on such high standards resulted in unexpected accomplishments which then made possible the extensive application of the process far beyond the original conception.

While in actual practice uniformity of adhesion is generally obtained by the use of a cement and in some cases a tie gum or skimcoat, it may be of interest to show some adhesion test figures obtained where a wide range of rubber stocks was adhered directly to the brass without any intervening cement.

In the following table each hardness range represents a group of four or five different compounds, all of which were vulcanized into individual parts of the same standard design.

Stocks Adhered Directly to Plated Metal. No Cement

Hardness Range	Adhesion Strength Pounds per Square Inch
29 to 34	277 to 510
36 to 40	497 to 604
44 to 48	477 to 658
47 to 57	600 to 812
57 to 63	426 to 799
69 to 74	640 to 796
76 to 80	764

While there is considerable overlapping in the adhesion obtained in the different groups, which is due largely to the difference in the compounds, in general the adhesion strength increases with the durometer hardness, reaching a maximum adhesion strength when the hardness is between 60 to 70.

Theory of Adhesion

Many theories have been advanced as to the action which permits adhesion of rubber to brass. However, none of these theories checks with all of the facts that have been obtained from extensive observations. While numerous facts tend to prove certain theories, other observations disprove those lines of reasoning. There are several possibilities which one may consider: a direct chemical bonding of the rubber to the metal; a physical interlocking of the rubber in the pores of the brass; or simply the wetting of the surface. Other questions which are as yet unanswered are: what part does the brass play in this activity; why is the composition of the brass so important; and why must this composition be limited within such narrow ranges? At a later date we hope to answer these questions and present more definite facts on the reasons why adhesion between rubber and metal is obtained.

Ficus Elastica Latex

(*Continued from page* 33)

form a coherent layer or skin on the anode. Normal Ficus latex, where the particles are suspended in the serum, behave in the same way as a suspension of serum-free particles.

This behavior of Ficus latex is interesting also from another point of view. It shows that the adherence of latex particles to each other caused either by discharging electrolytes or by the electric current is not determined by their consistency, but primarily by the nature of their protecting substance, i.e., it is related to the stability of the latex. For the soft Ficus particles behave in this respect exactly like the hard Abiarana Gutta Percha particles (unwashed); whereas Hevea particles, the consistency of which lies between these two extremes, behave differently in this particular owing to the fact that they are insufficiently protected.

Coagulation with Polar-Non-Polar Liquids

The stable Ficus latex, like all other latices, can be coagulated in the manner described in previous papers,[8] by polar-non-polar organic liquids, which form a second phase with the latex. The two liquid phases do not separate so readily, however, as in the other cases owing to the fact that the organic liquid phase is emulsified in the latex. The same slowness in separation was observed in old decomposed Jelutong latex[9] where the emulsifying substance was found to be a resin soap (or resinic acid), the existence of which in Ficus latex we assumed above. Hence it is not surprising to find even a stronger emulsifying action in Ficus than in Jelutong latex. On discharging the system with acids or other electrolytes the emulsion becomes less stable and is therefore coagulated in a shorter time by polar-non-polar liquids, but even then repeated shaking of the system is necessary for complete coagulation.

Comparative Properties of Different Latices

It is interesting to compare the properties of the different kinds of latex which we have been investigating with those of Hevea latex. This has been done in the foregoing table. We do not intend to say that these four latices represent special types. The main point is to show how very differently these milky saps, coming from different species of plants, behave.

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[8] F. K. Daniel, H. Freundlich, K. Söllner, *Trans. Faraday Soc.*, 33, 890 (1937).

[9] F. K. Daniel, H. Freundlich, K. Söllner, India Rubber World, Feb. 1, 1938, p. 50.

Rubber in Netherland India

The Rise and Growth of Estate and Native Cultivation[1]

F. Van Gogh [2]

IT IS a very widespread opinion that native rubber cultivation in the Outer Provinces is largely to blame for the overproduction of rubber in the years following 1930. In an article entitled "The Price Drop in the Rubber Market"[3] one author advanced the often-repeated idea that because natives had also planted *Hevea* seeds when clearing the forests and planting padi, the estate rubber cultivation, *which had been started very much in advance* of the native cultivation, was fast being equalled. The words italicized by the author are frequently used to indicate the responsibility of the native planting for overproduction.

History

Until near the end of the last century all of the rubber consumed was of the wild type, principally from Brazil, and it was not until 1907 that plantation rubber began to assume any importance. Table 1 from "The World's Rubber Position" compares world production of wild and plantation rubber in the years 1900-1920.

TABLE 1. REVIEW OF WORLD RUBBER PRODUCTION—IN TONS

	Plantation Rubber	Brazilian Rubber	Other Wild Rubber	Total
1900	4	26,750	27,136	53,890
1901	5	30,300	24,545	54,850
1902	8	28,700	23,632	52,340
1903	21	31,100	24,829	55,950
1904	43	30,000	32,077	62,120
1905	145	35,000	27,000	62,145
1906	510	36,000	29,700	66,210
1907	1,000	38,000	30,000	69,000
1908	1,800	39,000	24,600	65,400
1909	3,600	42,000	24,000	69,600
1910	8,200	40,800	21,500	70,500
1911	14,419	37,730	23,000	75,149
1912	28,518	42,410	28,000	98,928
1913	47,618	39,370	21,452	108,440
1914	71,380	37,000	12,000	120,380
1915	107,867	37,220	13,615	158,702
1916	152,650	36,500	12,448	201,598
1917	213,070	39,370	13,258	265,698
1918	255,950	30,700	9,929	296,579
1919	285,225	34,285	7,350	326,860
1920	304,816	30,790	8,125	343,731

Some of the more far-sighted men in the 1860's saw the danger of the extinction of wild rubber trees with increasing rubber demand, and through their efforts cultivation of plantation rubber was begun.

After several failures the director of the famous botanical garden at Kew, England, succeeded in 1873 in obtaining from a Mr. Markham in South America several hundreds of rubber seeds of the *Hevea brasiliensis* type. From these less than a dozen trees were obtained, eight of which were sent to Calcutta where they grew, but none too thrivingly. In 1876 the garden at Kew received 70,000 rubber seeds from Mr. Wickham in Brazil. From these some 7,000 trees were grown, most of which were sent to Ceylon and other British colonies; a few samples, however, were sent to Buitenzorg, Java. A third shipment from the Amazon region, sent by Mr. Markham, was received at Kew toward the end of 1876. This shipment consisted of young trees, some of which were immediately transshipped to Ceylon.

The first importation of *Hevea* seeds into Netherland India of any consequence was in 1882. These were sent by the Netherlands Consul General at Penang and resulted in 33 young rubber trees.

The Cultivation of *Hevea Brasiliensis*

Practically all of the trees of the *Hevea brasiliensis* species in Netherland India and in southeastern Asia were descended from the importation of 1876. The cultivation of *Hevea* in the 30 years following its introduction did not progress rapidly, which fact was due primarily to the unfavorable methods of tapping used at that time, whereby the trees produced so little rubber that preference was given to the cultivation of *Ficus elastica*. Researches conducted by Curtis, Willis, and Parkin (1897-1899) which pointed out that proper tapping of *Hevea* trees would produce higher yields of rubber than other species led to a more extensive cultivation of *Hevea* trees.

It should be mentioned here that the very first rubber plantations consisted of *Ficus elastica* trees. These were laid out by Hofland of Wera in the Pamanoekan and Tjiasemlanden in 1864 and at Tjikandi Oedik in Bamtam[4] in 1876.

Hevea Cultivation on Estates in Netherland India

At the turn of the century rubber plantations in Netherland India consisted chiefly of cultivated *Ficus elastica, Manihot Glaziovii,* and *Castilloa elastica.* As late as 1901 the government Bureau of Forestry started the cultivation of *Ficus elastica* on a large scale, and the change over to *Hevea* was not begun until about 1908. From the reports of the "'sLands Caoutchouc Bedrijf" (Government Rubber Estates) the data shown in Table 2 have been compiled.

TABLE 2. EXISTING PLANTATIONS OF THE GOVERNMENT RUBBER ESTATES, IN HECTARES

At the End of	*Ficus*	*Hevea*
1910	3,025	596
1913	2,313	3,814
1917	988	6,998
1921	Totally written off	9,508

The first effective stimulant to the cultivation of *Hevea* rubber was the high rubber prices prevalent in the years 1909 to 1912. In later years also expansions in estate *Hevea* cultivation followed closely the fluctuations in market prices; when prices were high, expansion was rapid, but when prices were low, expansion was slow. In 1936 the end-result of this expansion was a total estate plant-

[1] Abstract of a translation forwarded by the United States Bureau of Foreign and Domestic Commerce, Washington, D. C.

[2] Bureau of Agriculture of the Netherland Indian Department of Economic Affairs, Batavia, Java.

[3] *Bataviaasch Nieuwsblad,* Nov. 12, 1937.

[4] K. W. van Gorkom, "Oost-Indische Cultures" (1919). 1864 may be considered as the birth year of estate rubber cultivation in Netherland India and probably also in the entire world.

ing in the entire Netherland India of 596,000 hectares, as shown in Table 3, which covers the trend of planting from 1902 to 1936 inclusive. From this table it may be noted that estate planting was increased in the years 1925-1930 by 180,000 hectares. The first 100,000 hectares were laid out in 1910, the second in 1913, the third, fourth, and fifth in 1918, 1925, and 1928 respectively. Record planting was reached in the first restriction year, 1934, when total planting amounted to 601,286 hectares.

TABLE 3. TOTAL PLANTING OF ESTATE RUBBER IN HECTARES (FROM 1920 ON, ONLY THOSE WHICH CONCERN HEVEA RUBBER; PRIOR TO 1920, INCLUSIVE PLANTINGS OF OTHER RUBBER-PRODUCING SPECIES OF TREES)

In	Java and Madura	Outer Provinces	Total
1902	.....	176	176
1903	.....	423	423
1904	.....	652	652
1905	.....	1,338	1,338
1906	10,117	2,428	12,545
1907	15,379	8,094	23,473
1908	24,282	15,783	40,065
1909	43,303	27,115	70,418
1910	63,943	40,470	104,413
1911	84,178	64,752	148,930
1912	93,081	89,034	182,115
1913	103,150	97,128	200,278
1914	108,204	130,918	239,122
1915	109,215	?	?
1916	117,305	?	?
1917	?	?	263,055
1918	153,018	159,390	312,408
1919	150,832	190,068	340,900
1920	157,299	195,418	352,717
1921	164,532	204,393	368,925
1922	166,985	210,999	377,984
1923	168,881	213,376	382,257
1924	171,279	222,665	393,944
1925	180,478	234,470	414,948
1926	194,720	251,167	445,887
1927	210,642	274,831	485,473
1928	222,781	302,865	525,646
1929	224,841	322,715	547,556
1930	228,923	344,091	573,014
1931	229,013	353,265	382,278
1932	222,799	359,397	582,196
1933	228,766	364,005	592,771
1934	232,950	368,336	601,286
1935	230,162	365,147	595,309
1936	230,074	365,885	595,959

The above figures which are relative to the years 1902-1924 have been quoted from "Mededeeling No. 21 van het Centraal Kantoor voor de Statistiek" (Communication No. 21 of the Central Bureau of Statistics); the data for the later years were compiled from the reports "De Landbouwexportgewessen van Nederlandsch-Indie (Export Crops of the Netherland India, published every year. Year by year they are the result of the planting of the preceding year plus the replanting, minus the written off planting—in short they have been corrected as much as and whenever inaccuracies are found in the figures for the previous years.

Hevea Cultivation in Malaya

Rubber cultivation in Malaya has shown about the same trend of development as estate cultivation in Netherland India, the planting also was influenced by the market price of rubber. An indication of the importance of the rubber cultivation in Malaya (also in Netherland India) in its present extent is shown in Table 4.

TABLE 4. BASIC QUOTAS FOR 1937 OF THE COUNTRIES PARTICIPATING IN THE RUBBER RESTRICTION

Participating Countries	1937 Basic Quota in M Tons		1937 Basic Quotas in % of Total
1. Straits Settlements, F.M.S., U.M.S., and Brunei	598,424		45.3
2. Netherland India			
Estate Rubber	276,660	21.0	40.1
Native Rubber	251,660	19.1	
3. Ceylon	82,296		6.2
4. British India	12,700		1.0
5. Burma	9,144		0.7
6. North Borneo	15,748		1.2
7. Sarawak	32,004		2.4
8. Siam	40,640		3.1
Total	1,319,276		100.0

According to "Malayan Agricultural Statistics," the annual publication of the Department of Agriculture in the Straits Settlement and the Federated Malay States, the total planting in Malaya of the "small holdings" (less than 100 acres) at the end of 1936 was 1,214,942 acres, that of the "estates" (100 acres or more), 2,021,702 acres, giving a total of 3,236,644 acres (one acre=0.40467 hectare) or 1,309,775 hectares.

Hevea Cultivation by the Natives in the Netherland India

As a result of the investigations made in 1924-1925 in the principal native rubber districts, A. Luytjes[5] gave the following, briefly summarized, general review of the rise and growth of the native rubber cultivation:

(a) The close contact which the Mecca pilgrims, emigrants, and merchants of Borneo and the entire eastern side of Sumatra had with Singapore and Malaya was the primary reason for the rise of the native rubber cultivation in the Outer Provinces. At first only a few persons took up this cultivation, but the high prices ruling in the period between 1910 and 1912 caused a comparatively large number of natives to enter into the industry. An active business in seeds and young trees was thereby created.

(b) Following a drop in 1913 and 1914, rubber prices again went up toward the end of 1915; in the same period seeds and young trees from the plantations of the local natives themselves became available in increasing quantity. The cultivation developed into a common native cultivation. Borneo and Djambi were the first districts where the cultivation succeeded. Between 1915 and 1920 much rubber replanting was being undertaken.

(c) No further replanting was noted in the depression years 1921-1922, but toward the end of 1922 a rapid expansion began, which was continued with greater acceleration in the period 1924-1927.

An indication of the early growth of the native rubber cultivation, together with a comparison with that of the estates, is found in table 5, which shows the productions of both the natives and the estates (in connection with the former, account was taken of the different washing percentages calculated in the exports).

TABLE 5. NETHERLAND INDIAN RUBBER PRODUCTION—IN METRIC TONS[6]

In the Year	Estate Product: Java	Estate Product: Outer Provinces	Estate Product: Total	Native Rubber in the Outer Provinces (Net Dry)
1919	26,785	39,274	66,059	13,000
1920	27,258	41,798	69,056	10,000
1921	24,514	37,473	61,987	6,000
1922	28,902	43,261	72,163	17,000
1923	34,154	47,540	81,694	36,000
1924	37,773	52,518	90,291	56,346

Comparison between Estate and Native Rubber Cultivation (N.E.I.)

The rise and growth of estate rubber cultivation exhibits many points in common with that of native rubber cultivation. Prior to 1909 both estates and natives had *Hevea* plantations. In the years 1909 to 1912 the high rubber prices stimulated both estate and native planting, and in the years that followed expansion in estate and native cultivation followed the trend of rubber prices.

There were, however, differences in these two types of cultivation. The estates had experimental plantations at their disposal prior to 1900; while the earliest native gardens were started a few years after 1900. The natives stopped importing planting materials immediately after their own plantations began producing sufficient seeds, but the estates continued such importations for several years. The estates having more capital increased their areas during the first boom (1909-1912) more than did the natives. However in the first three years of the second boom (1915-1920) the natives made up most of

(*Continued on page* 47)

[5] "De bevolkingsrubbercultuur in Nederl. Indie" (The Native Rubber Cultivation in Netherland India) Part VII, Final Report (1927).
[6] "Mededeeling No. 21 van het Centraal Kantoor voor de Statistiek" (Communication No. 21 of the Central Bureau of Statistics).

London Rubber Conference

Classified Indication of Technical Paper Contents[1]

A. R. Kemp

THE voluminous character of the subject matter and the topic ramifications as covered by the recent international conference arranged by the Institution of the Rubber Industry has been indicated in the June issue of INDIA RUBBER WORLD. The purpose of this article is to present briefly in a correlated manner sufficient essentials regarding the ideas and conclusions contained in the papers to enable those not attending to gain a general understanding as to the scope of the presentation and then to select for further study such papers as may be of particular interest. No attempt has been made to discuss or abstract the papers exhaustively. Comments referring to individual authors are arranged according to related subject matter, following the same grouping in which they were presented. In parenthesis following each author's name is the paper number assigned on the preprint, and at the end of this article the titles of the papers are grouped by general subject and then listed in numerical order.

At the time of preparation of the report published in the June issue, available information indicated that 107 papers were presented, but only 103 preprints were received for review. If omission of reference to any presented paper has occurred, it is not intentional, but rather due to conditions attending the distribution of such a large number of manuscripts.

General Technology

In standardizing the parallel plate (plasticity) test, Odenwald and Baader (44) have measured hardness, elasticity, and load required to prevent recovery when the compressive force is removed. Hoekstra (63) described a simple plastometer which gives accurate results 90 seconds after removing a sample of rubber from the mill. Heywood (71), who took elaborate precautions to insure uniform processing, concluded that raw rubber variation persists in the finished product.

Leduc (80) described a method to facilitate rapid vulcanization of thick rubber articles by using the rubber as an insulating dielectric between the plates of a condenser to which is applied a high frequency oscillatory electric potential. Thiollet (97) described a laboratory autoclave for vulcanizing rubber samples at 195° C. in glycerine and under nitrogen pressure to prevent porosity. Redfarn and Schidrowitz (79) have developed a machine for extruding chlorinated rubber at 350° F., at which temperature it expands to a porous material of low density.

Yamazaki (50) presented information on the growth of the Society of Rubber Industry of Japan, which now has a membership of 670 and publishes a monthly journal.

[1] INDIA RUBBER WORLD has on file a full set of official abstracts and complete copies of the 103 papers and upon request will be glad to furnish further details regarding individual papers. It is our understanding that bound copies of the complete Conference Proceedings of over 1,000 pages, containing 103 papers and edited discussions, may be obtained from the Institution of the Rubber Industry, 12 Whitehall, London, S.W. 1, at a cost of £2/2, plus duty and postage.

Chemistry

It was brought out by Rideal (91) that the elasticity of rubber is associated with the fact that the mean chain length of the rubber hydrocarbon is less than that of fully extended chains and that introduction of cross links increases rigidity and reduces extensibility. Bekkedahl (6) discussed the thermodynamics of the isoprene-rubber system. The synthesis of polymers by the photochemical method was covered by Bolland and Melville (90), who showed that, when irradiating chloroprene vapor with light, true polymerization takes place. Bacon and Farmer (56), in discussing the addition of maleic anhydride to rubber, considered that the maleic anhydride is probably linked between neighboring double bonds in the same rubber molecule or between adjacent double bonds in the same or different molecules.

Staudinger (98) showed that pure rubber prepared with exclusion of air remains soluble in benzene if air and light are excluded. A small amount of air converts this rubber into an insoluble form, which will swell, but is not completely soluble. However, more atmospheric oxygen causes the insoluble rubber to become soluble again. Long thread-molecules of soluble rubber become linked together by a few oxygen bridges to form three-dimensional macromolecules (insoluble). These are broken down by oxidation into shorter molecules (soluble). The final soluble rubber, however, is not identical with the original, and the reactions are not reversible.

Cyclized rubber using boron triflouride as the cyclizing agent has been prepared by Stevens and Miller (7); the properties of this cyclized rubber were discussed chiefly from the commercial point of view. Stevens and Rowe (8) have found that it is necessary to carry out the extraction of raw rubber with acetone in the dark if accurate results are to be obtained; light exposure may give results 25% greater than the true values.

The rate of breakdown of rubber in a laboratory internal mixer, according to Busse and Cunningham (23), is a minimum at about 240° F., the rate being increased four- or five-fold by raising or lowering the temperature 80° F. The increase in breakdown rate at the higher temperature is probably due to oxidation, and at the lower temperature may involve mechanical activation.

Experiments by I. Williams (24) showed no direct evidence in support of the theory that the characteristic properties of vulcanized rubber result from the formation of sulphide (thio-ether) linkages between adjacent rubber molecules.

Whitby and Simmons (89) found no accelerating activity of compounds containing structures related to the carbodithioic group, CS.SH, such as simple mercaptans, thioamides, and dithiocarbamate esters; piperidine proved to be the most effective organic base for activating ultra-accelerators.

Stevens and Popham (9) have vulcanized oxidized rubber (Rubbone) with sulphur; the amount of sulphur combining with the Rubbone is consistent with the reduction in unsaturation, the result of oxidation of the original rubber, except in the case of highly oxidized rubber which compares with the intermediate oxidized products in this respect. Becker (96) discussed the stabilization of chlorinated rubber, which is necessary because of the continual splitting off of traces of hydrochloric acid; fixation of the chlorinated rubber molecule may be brought about by the addition of materials such as ethylene oxide and its derivatives which combine with hydrochloric acid, but do not alter the pH value.

Physics

Gibbons, Gerke, and Cuthbertson (36) brought out that there is close correlation between the T-50 value and the percentage of combined sulphur in compounds without zinc oxide, but in the presence of zinc oxide the relation varies according to the accelerator used.

It was found by Kemp and Herrmann (17) that the zinc oxides of the smallest particle size and with the least water-soluble matter give the best dielectric properties in rubber; however with carbon black, the smaller the particle size and the better the dispersion, the greater are the increase in dielectric constant and power factor and the decrease in resistivity (coarse soft blacks are superior to gas blacks for electrical insulation purposes).

Zwikker (19) dealt with the variation in power factor of a technical rubber compound over a wide range of frequency and pointed out that two prominent peaks occurred in the frequency power factor curve; the first peak is attributed to the Maxwell effect and the second to a dipole effect.

Porritt (77) summarized the results of an investigation on the nature and properties of hard rubber carried out by a number of collaborators over a period of years. The results are discussed under three heads: surface deterioration in light and air; plastic deformation at elevated temperatures; and influence of rubber-sulphur ratio and vulcanizing conditions on properties.

Daynes (83) pointed out modifications needed in Fick's Law for obtaining a satisfactory mathematical explanation of the diffusion of water through rubber; the implications of a new equation based on a modified theory were presented. Blake and Morss (20) also dealt with the mathematical relations between time and amount of water absorbed and presented an equation which holds for cases where equilibrium is not reached and over the first part of the range in equilibrium cases. A new empirical equation was also proposed which satisfies most observations over the middle of the range.

Clews (34) in an X-ray study of stretched raw rubber showed the unit cell to be monoclinic, the original idea of an orthorhombic cell structure being inconsistent with the experimental data. Results were also recorded from a study of butadiene, isoprene, and chloroprene. According to Gehman, Field, and Dinsmore (35), rubber hydrochloride has a crystalline X-ray structure; balata hydrochloride, however, gave an amorphous pattern. From a study of the gradual appearance of the crystalline structure as the hydrochlorination of the rubber proceeds, it was concluded that a certain amount of cyclization occurs.

Mark (46) discussed rubber-elasticity and gas-elasticity, pointing out that rubber molecules will always attempt to assume configurations of maximum probability (rubber will contract from the improbable extended state to a more probable state of contraction), a property in direct opposition to the behavior of a gas. An equation of state for an ideal rubber which permits the calculation of the molecular weight of the main-valency chain was presented; the mutual reactions of adjacent chains must be taken into account, however. Van der Wyk and Meyer (66) presented formulas for determining the internal friction or viscosity and the shearing modulus from torsional oscillation tests on cylinders of vulcanized rubber; internal friction was found to increase quite rapidly even at quite small deformations; while the elasticity was found to increase much less.

Utilizing the analogy of an electric circuit subjected to an alternating electromotive force, Kosten (59) developed equations relating to the behavior of rubber when subjected to alternating compression. Young's modulus calculated from static tests was found to be smaller than the modulus calculated from dynamic tests, the ratio of the two moduli lying between one and two. Wood (22) has critically surveyed the available data on sixteen of the important physical constants of rubber in the fields of mechanics, heat, optics, and electricity, tabulating the most probable values. Dawson (42) recommended international action on the clarification of rubber terminology with the view of establishing a standard glossary.

Durability

An apparatus for measuring the absorption of oxygen by vulcanized rubber exposed to air at any desired temperature was described by Milligan and Shaw (2), who hold that the aging quality of rubber can be more quickly determined by this method than by following the decline of tensile strength. The new method utilizes pulverized samples. Oxidizability, according to Dufraisse (31), may afford a reliable indication of variations or errors in the compounding and processing of rubber; however only fairly large test differences should be considered. The manometric method for determining oxidizability of rubber which provides a quick means for control-testing finished articles, was discussed by Dufraisse and le Bras (32). The various processing factors which affect the results of this test, including: time and temperature of cure and the proportion of plasticizer, filler, accelerator, sulphur, etc., were considered. The Ter Meulen method for the direct determination of oxygen in organic compounds has been modified by H. I. Cramer, Sjothun, and Oneacre (26) to apply to the analysis of rubber; the method has been applied to the study of aging properties in the Geer oven and oxygen bomb.

Oxidation products which may be developed during vulcanization and aging of rubber have been determined by van Rossem and Dekker (103) who stress the importance of such determinations for rubber articles which cannot be tested mechanically. Morgan and Naunton (69), after measuring the rate of oxidation of rubber at constant pressure and constant volume, reported that the rate is independent of oxygen pressure and varies with temperature according to the Arrhenius equation. The depth of oxygen penetration has been calculated for temperature, oxygen pressure, permeability, and rate of oxidation. Minatoya and Andô (5) showed that small proportions of *m*-dinitrobenzene limit the vulcanization of ordinary sulphur containing compounds to a primary period, thus giving vulcanizates whose resistance to bomb aging is equal or superior to that of rubbers containing aldol-*x*-naphthylamine; diphenylguanidine must be used as the accelerator to obtain this effect.

Marzetti (61) indicated certain objections to accelerated aging tests which utilize elevated temperatures, and he proposed room temperature aging in the presence of air and diffused daylight, obtaining the necessary accel-

eration through the use of certain wild rubbers or acetone-extracted plantation rubber. The preservative power of various antioxidants, accelerators, and other materials has been evaluated through this method. In investigating the changes in the fluorescence effects observed when subjecting rubber compounds to ultra-violet light, Oberto (75) found that fluorescence varies with the increase of vulcanization and with increased aging (natural or artificial). With this method the partial or total occurrence of oxidation can be quickly detected. After comparing the effects of aging on a number of inner tube compounds under normal storage conditions in England and Egypt and under accelerated conditions in a Geer oven, Scott (67) concluded that the Geer oven test tends to minimize the differences between good and bad aging rubbers and does not show up sensitiveness to light; the Geer test will, however, indicate rubber which will age badly in the dark under normal conditions. In connection with the deterioration and swelling of hot water bottle linings. Robertson (52) pointed out that aging of the rubber increases its capacity to absorb water; the swelling can be retarded by the use of an antioxidant.

Stevens and Gaunt (37) described tests on the deterioration of rubber in latex-treated cotton cloth and found that vulcanization protects the rubber considerably against sunlight, but not against oven aging; protective agents which were found to be efficient were diphenylamine and *m*-toluylene diamine, and some dyes. Investigating the aging of rubber deposited from latex on wool fibers, Blow (101) noted that when washed in alkaline soap solution, rubberized samples which had been exposed to the daylight lost 90 to 95% of the rubber, but unexposed samples lost only 5 to 15%; exposure to daylight did not affect binding of the fibers by the rubber. Griffiths and Pinnell (49), in discussing rubber thread testing, stressed the importance of modulus of the rubber and pointed out how the form of the stress-strain curve has become modified by the introduction of accelerators. In addition to natural and artificial aging tests, methods for determining the behavior of rubber thread under various service conditions were given. When in contact with oil, the superiority of Neoprene thread was also pointed out.

Blake and Bruce (21) have found that commercial antioxidants accelerate the tackiness of raw rubber exposed to light, but that certain other substances such as benzidine, sulphur, and hydroquinone exhibit a protective action. As a possible explanation it is suggested, following the distinction previously recommended by Dufraisse, that the latter substances are antioxidants (which protect against peroxides formed by light) and the commercial antioxidants are anti-oxygens (which protect against oxidation in the dark or at elevated temperatures). Doede (65) has found that oxidation potential can be used as a rapid test for evaluating proposed antioxidants; antioxidants usually have critical oxidation potentials between 0.65- and 0.90-volt. Sibley (27) pointed out that the ketone-amines of greatest value as antioxidants are derivatives of dihydroquinoline; those of less value are probably of the acetone-anil type. Combet and Vilquin (10) discussed the relative merits of antioxidants and aging tests.

Sagajllo, Bobinska, and Sagano'wski (14) found that resistance to freezing can be increased by reducing filler content and increasing the cure and that little effect is produced by softeners. They concluded that the effects of cold are connected with the structure or changes in structure of rubber. Somerville (15) compared some properties, notably hardness and tensile, of two pure gum compounds, at low temperatures, with high and normal sulphur content respectively. Both compounds, although brittle at −60 C., had an elongation at break of over 500% and tensile strength of over 5,000 pounds per square inch when tested at this temperature. High combined sulphur produced a marked increase in hardness at low temperatures. Substitution of deproteinized rubber for smoked sheet apparently produced greater resistance to hardening at temperatures down to −40 C. According to Carrington (92), the hardening effect of low temperatures increases with decreasing sulphur content, and the increase in permanent set on cooling is least with the compound containing the largest amount of sulphur.

Roelig (64) stressed the necessity of testing rubber dynamically in most of the more important applications of rubber and from results obtained on a cleverly designed apparatus concluded that: absolute damping increases with increasing alternating load, but percentage damping does not change; percentage damping does not change with changing static loads; only a slight increase in damping results from increasing the frequency of oscillation (0.5 to 1,000 cycles). In studying the dynamic properties over a very wide range of oscillation frequencies (up to 875 cycles per second), Naunton and Waring (53) showed that "high frequency" resilience reaches an optimum with time of vulcanization more quickly than does resilience as measured by the pendulum method (Roelig's results at 1,000 cycles per minute coincide more closely with the pendulum results). Naunton and Waring also found a substantial increase in modulus and a marked decrease in resilience with rise in frequency. Jones and Pearce (87) described a pendulum method which utilizes an apparatus that provides a simple and accurate means for routine checking of the resilience properties of rubber.

Levi (30) described a cutting test for tire tread stocks, said to simulate actual service conditions more nearly than tests with a falling knife. Bradley (76) presented two bursting tests for sheet materials: in one the deformation is produced by fluid pressure, and in the other a plunger of definite dimensions and shape produces the deformation.

Behre (12) indicated the lack of standardization in methods of rubber testing and concluded that optimum vulcanization should be determined not from tensile strength, but from a consideration of modulus at 200% elongation, hardness, resilence, and tear resistance.

Applications

The introduction of the pneumatic tire for farm tractors in the United States and also the adoption of tires for horse-drawn vehicles are the outstanding recent developments in the farm equipment industry, according to Hay (45): improvements in tire design have included deeper treads and increases in diameters. The enormous potential use of rubber in agriculture was pointed out by Petithuguenin (74); the general adoption of pneumatic tires for agricultural carts, which would enable a saving of 33 to 50% in tractive power, in France alone would result in a consumption of 20,000 to 30,000 tons of raw rubber annually. A new type of cushion tire for heavy and fast motor vehicles was described by Venosta (95); the new tire allows the use of a very wide and flattened tread without permitting excessive heating up, thus resulting in greater wear. The history, functions, financing, and successful operation of Autogummi-Forhandler-Foreningen, the Danish tire marketing organization, were reviewed by Kjolsen (3).

An electrical dynamometer for determining the performance characteristics of flat and "V"-type rubber transmission belts was described by Brazier, Holland-Bowyer,

and Mellers (100). Results obtained indicate that flat rubber and balata belts, contrary to leather belts, transmit almost their maximum torque before slippage becomes appreciable.

Gibson (68) predicted that, if odor and tendency to perish could be eliminated, the use of rubberized sisal and other vegetable fibers in place of horsehair for mattresses and upholstery would be an important field of application for rubber. The technique and advantages of covering rubber threads with a textile material were described by Ebblewhite (88); these threads are used as weft threads in conjunction with warps containing elastic threads to produce two-way stretch fabrics. Davis (94) pointed out the following advantages of latex thread: fineness of count obtainable, possibility of production in any required length, and resistance to washing and boiling.

Krauz and Franta (13) showed that metal resinates cause a rapid reduction in the viscosity of rubber solutions for use in oil varnishes; the effect is reduced in the presence of nitrogen; antioxidants also reduce the effect, but they impede drying. Oeser (47) held that rubber can be employed in most cases of elimination of vibration, provided suitable calculations be made. As a case in point he develops and explains the calculations necessary in eliminating vibration in a small passenger boat fitted with two engines developing 300 h.p.

Forster and Lion (41) discussed difficulties encountered in the manufacture of rubber insulated cables including: ozone resulting from corona at voltages higher than five kilovolts; pores in extruded coverings; effects on rubber of copper salts from conductor; and the action of the ammonia on copper in latex-insulated wires. Remedies for these difficulties were indicated. Methods whereby the various drawbacks to the use of rubber in high-tension cable may be overcome were proposed by Jamey (48). It was indicated that some of the more recent synthetic materials may find application in this field. According to Jamey, the use of a semi-conducting layer of rubber-graphite compound will protect lead sheathed underground cables against electrolytic corrosion by allowing a minute current to pass. Heering (84) covered points connected with high tension cable including: dielectric properties of rubber; ozone resistance; and conducting and semi-conducting rubber compounds.

Barron (99) discussed the plastic substances produced by the chemical treatment of rubber with different reagents. Products considered include oxidized, halogenated, hydrohalogenated, and cyclized rubbers.

Compounding Materials

Colloidal carbons, according to Wiegand and Snyder (33), have been found to accelerate vulcanization in rubber-sulphur mixes; disturbances which occur when colloidal carbon is used with accelerators are due to the selective adsorption properties of the carbon. The pH value of rubber carbons was said to be the best guide to their "rate of vulcanization." Implications resulting from the possible development of mono-molecular zinc soap layers on colloidal carbon were also discussed. In studying carbon blacks, Roberts (54) found that values from the T-50 test formed a more sensitive index to the state of vulcanization, and therefore to the effect of the black on vulcanization, than do tensile test results.

The problem of manufacturing high-class carbon blacks from materials other than natural gases may be said to be technically solved, according to Bruni and Levi (29); it appears to be necessary to use an impingement process to obtain satisfactory results. A number of tests for carbon blacks in rubber compounds, including the compression flexometer test, the pendulum impact and rebound test, the T-50 test, and tests of dielectric properties, were described by Drogin (18); these tests indicate differences between blacks that give similar stress-strain properties.

The history of the rubber reclaiming industry was reviewed by Alexander (55), who discussed: the "heat" process of Clapp, the "acid" process of Mitchell, and the "alkali" process of Marks. Bacon, Farmer, and Schidrowitz (57) prepared mixtures of synthetic resin latices and rubber latex which were coagulated with acetic acid, the coagula being formed into crepe. The possible implications of these intimate resin-rubber mixtures were discussed.

Latex

Twiss and Carpenter (60), in discussing Hevea latex, pointed out that heating does not alter the isoelectric pH of the latex and therefore does not affect the protein film on the latex particles to a marked extent. The exceptional behavior of methyl cellulose as a creaming agent was indicated, and a new theory for creaming was set forth based on the formation, by the molecules of the creaming agent, of a three-dimensional network which entraps and immobilizes the water phase. Hauser and Bender (43) proposed that latex stability is largely due to the electrokinetic potential of the particles. In connection with investigations regarding the effects of an excess amount of caustic alkali in latex, they concluded that the lowering of the electrokinetic potential and the cataphoretic velocity is due to a greater degree of adsorption of sodium ions than of hydroxyl ions. It was also inferred that the protection of the latex particle is caused by a non-coherent protein layer.

Kemp (16) reported the results of a comprehensive study of the composition and properties of balata latex.

Jordon (51) defined the "KOH number" of latex as the number of grams of KOH per 100 grams of rubber corresponding to the end point in the electrometric titration of latex; the end point is the point of inflection on the pH curve. The amount of KOH to be added for optimum stabilization of latex mixings, containing zinc oxide, but no buffers, was found to vary with different latices and to be numerically equal to the KOH number; with other alkali-absorbing materials present, additional KOH is required.

Upon creaming latex, Vester (58) found that the agglomerates formed are reversible on diluting with water; upon diluting with the separated serum, however, the agglomerates remain unimpaired. Agglomeration was considered not to be simple adhesion, but a result of a reaction (possibly "mutual desolvation") between the creaming agent and some of the serum constituents, possibly protein. These results were based on a microscopical investigation utilizing such colloidal creaming agents as tragacanth, Konjaku meal, and pectin.

Noble (25), after conducting experiments on the purification of rubber by various treatments, concluded that: the most effective purification obtained is by alkali-hydrolysis; centrifuging is more effective than creaming; water absorbing capacity is related to the amount of protein, ash, and water-soluble substances present, being proportional to protein content in unvulcanized rubber and to water-soluble content in vulcanized rubber.

Willott (39) brought out that the determination of the degree of whiteness of latex by direct vision is difficult and discussed the scientific principles underlying white-measurement, giving the advantages and limitations of the various instruments, particularly the Donaldson Colormeter and the Blancometer which are costly and should be used only by a trained scientist. For less accurate determina-

tions and for rapid control work, Murphy (72) described two devices: in one the latex is compared with two standard cements of yellowish cream and gray shades, respectively; the other compares the color of dried latex-films with two arbitrarily selected color standards. While Willott aimed at a numerical expression of color, Murphy's purpose was to determine if the latex was of acceptable color. Murphy also described a simple mechanical reproduction of the convenient hand-rubbing stability test and an alternative stability test, called the "Z.O.T." test, which is based on viscosity increase.

Flint (82) gave details of a modified high-speed stirring test for stability measurement using zinc oxide and clay and a frictioning test in which the latex is spread on a standard type of singed twill. Flint also described applications of the film-bursting method of testing dried latex to the evaluation of the rate of vulcanization and to oil- and solvent-resistance.

Van Rossem and Plazier (85) disclosed that the addition of a special brand of bentonite reenforces dried vulcanized latex films considerably as indicated by increased tensile strength, modulus, and solvent-resistance; they infer that the action is not primarily connected with the protein constituents.

Blow (38) recorded the cataphoretic velocity of oil particles in water and rubber particles in latex in the presence of "cationic" and "anionic" soap and concluded that the "cationic" soap is adsorbed more in alkaline solution and the "anionic" in acid solution.

In the preparation of halogenated derivatives of rubber from latex, Baker (73) revealed that the reaction with nascent chlorine proceeds exothermically, producing white powders, insoluble in solvents and containing 50% chlorine; by preventing temperature rise, soluble products are formed.

Plantation Subjects

Braak (70) contended that purified rubber, gutta percha, and balata deteriorate rapidly and that the aging properties of the better types of balata and the common yellow Tjipetir gutta percha are of the same order, the stability decreasing with increasing purity of the hydrocarbon. On the other hand, de Vries (4) held that the rubber hydrocarbon in itself does not appear to be markedly oxidizable. Rubber from caustic-treated latex deteriorated on storage; the same was true when rubber, after coagulation, was treated with a caustic solution or with alkaline serum. De Vries concluded that a decomposition product of caustic soda and serum accelerated the oxidation of the rubber.

Hastings (28) pointed out that No. 1 ribbed smoked sheet is now generally lighter in color than that formerly made on European owned estates and brought out that color is associated with plasticity only when conditions affecting the color are constant, but that there can be no general statement made to the effect that light colored rubber tends to be hard.

Cayla (11) recommended reproduction of Brazilian methods used in the preparation of fine hard Para to reduce the variability of plantation rubber and pointed out that this reduction in variability may be attained by paying attention to: choice of coagulant, temperature of coagulation, pressure exerted on the coagulum, and the addition to the raw rubber of certain non-rubber substances derived from the latex. The problems encountered on a plantation are divided by Eaton (93) into five groups: soil, tree health, planting material, latex and rubber preparation, and formation of the latex in the tree. Certain root diseases may be treated with copper which increases the copper content of the latex; this increase may be sufficient to induce tackiness in the rubber. Eaton also indicated that the sulphur compound present in latex may be the cause of incipient vulcanization and of variations in plasticity. A need of a study of the constitution and preparation of latex in a variety of plants was set forth by de Wildeman (1), who pointed out that the latex of *Hevea brasiliensis* represents a special case of the transformation of plant substances. It was suggested that comparative investigations be carried out on a wide range of different latices containing caoutchouc and related substances. P. J. S. Cramer (62) described a method for test-tapping young trees with the patented "Testatex" knife which consists of a flexible metal strip on which four V-shaped knives are attached; the knives are forced into the bark of the tree until they reach the wood. Experiments showed that the "Testatex" method could be used for differentiating between low and high yielding seedlings.

Synthetic Rubber-Like Materials

Stöcklin (86) described the principles of the formation of various types of synthetic rubbers, emphasizing the effect of the different chemical combinations on the physical and chemical properties of the product. Von Rosenberg (102) drew a distinction between the plastic properties required for satisfactory processing in true thermoplastics and in vulcanizable substances. Important rubber-like plastics were enumerated and their properties and applications described. Badum (40) proposed mixtures of synthetic rubber and purified gutta percha for cable insulating purposes.

Jones (78) showed that the scorching tendency of a typical Neoprene compound is entirely different from that of a rubber compound having a similar rate of vulcanization and drew attention to the value of sulphur to Neoprene in increasing the resilience and in decreasing the tendency after vulcanization to harden when stored. Garner and Westhead (81) discussed the oil-aging of "Thiokol F," "Neoprene," and "Perbunan N" in a standard lubricating oil heated to 70° C. and also the aging in air at 70° C.

List of Papers Presented

General Technology

(44) H. Odenwald and T. Baader, "Problems and Aims of the Control of the Workability of Natural Rubber and Rubber Stocks."
(50) T. Yamazaki, "Outline of the Present and Past Work of the Society of Rubber Industry of Japan."
(63) J. Hoekstra, "High-Speed Apparatus for Determination of Plasticity in Rubber Works, and Some Results."
(71) M. M. Heywood, "Influence on Final Product of Fast and Slow Vulcanizing Rubbers."
(79) C. A. Redfarn and P. Schidrowitz, "The Technical Production of Expanded Chlorinated Rubber."
(80) H. A. Leduc, "Applications of High-Frequency Current in the Rubber Industry."
(97) R. Thiollet, "Ultra-Rapid Vulcanization at High Temperatures."

Chemistry

(6) N. Bekkedahl, "Application of Thermodynamics to the Chemistry of Rubber." *
(7) H. P. Stevens and C. J. Miller, "Cyclized Rubber. Particularly Halide Transformations."
(8) H. P. Stevens and J. W. Rowe, "Note on the Extraction of Raw Rubber with Acetone."
(9) H. P. Stevens and F. J. W. Popham, "Vulcanization of Oxidized Rubbers."
(23) W. F. Busse and E. N. Cunningham, "Mastication of Rubber: A Study of Some of the Oxidation Processes Involved." *
(24) I. Williams, "The Distribution of Combined Sulphur in Vulcanized Rubber and Its Bearing on the Sulphide Linkage Theory of Vulcanization." *
(56) R. G. R. Bacon and E. H. Farmer, "Interaction of Maleic Anhydride with Rubber."
(89) G. S. Whitby and H. E. Simmons, "Some Experiments with Accelerators of Vulcanization."
(90) J. L. Bolland and H. W. Melville, "Some Remarks on the Photochemical Polymerization of Chloroprene and Some Related Molecules."
(91) E. K. Rideal, "Modifications in Rubber."
(96) W. Becker, "Contribution to the Problem of the Stabilization of Chlorinated Rubber."
(98) H. Staudinger, "Soluble and Insoluble Rubber."

Physics

(17) A. R. Kemp and D. B. Herrmann, "Dielectric Measurements in the Study of Carbon Black and Zinc Oxide Dispersion in Rubber."*
(19) C. Zwikker, "Dielectric Losses in Rubber."
(20) J. T. Blake and H. A. Morss, Jr., "Mathematics of Water Absorption by Rubber." *
(22) L. A. Wood, "Values of the Physical Constants of Rubber." *
(34) C. J. B. Clews, "Structure of Rubber."
(35) S. D. Gehman, J. E. Field, and R. P. Dinsmore, "An X-Ray Study of Rubber Hydrochloride."*
(36) W. A. Gibbons, R. H. Gerke, and G. R. Cuthbertson, "The T-50 Test for State of Vulcanization, II." *
(42) T. R. Dawson, "On Rubber Terminology."
(46) H. Mark, "Rubber-Elasticity and Gas-Elasticity."
(59) C. W. Kosten, "Static and Dynamic Properties of Rubber under Compression."
(66) A. J. A. van der Wyk and K. H. Meyer, "The Internal Friction of Vulcanized Rubber."
(77) B. D. Porritt, "Researches into the Nature and Properties of Hard Rubber."
(83) H. A. Daynes, "Some Practical Aspects of the Theory of Diffusion of Water through Rubber."

Durability

(2) A. G. Milligan and J. E. Shaw, "Measurement of the Absorption of Oxygen by Vulcanized Rubber in Air."
(5) S. Minatoya and T. Andô, "A Proposed New Method of Retarding the Aging of Vulcanized Rubber by Means of Peroxides and Nitro-Compounds."
(10) M. Combet and C. Vilquin, "Modern Principles of Preserving Manufactured Rubber."
(12) J. Behre, "A New Approach to the Physical Testing of Vulcanized Rubber."
(14) M. Sagajllo, J. Bobinska, and H. Sagano'wski, "The Behavior of Rubber at Low Temperatures."
(15) A. A. Somerville, "Some Properties of Two Vulcanized Pure Gum Compounds at Low Temperatures."*
(21) J. T. Blake and P. L. Bruce, "Effect of Light on Unvulcanized Rubber."*
(26) H. I. Cramer, I. J. Sjothun and L. E. Oneacre, "The Direct Determination of Oxygen in Rubber." *
(27) R. L. Sibley, "Ketone-Amine Products as Rubber Antioxidants." *
(30) T. G. Levi, "A Cutting Test for Tire Tread Stocks."
(31) C. Dufraisse, "Oxidizability as a Test for Determining the Quality of Rubber."
(32) C. Dufraisse and J. le Bras, "Estimation of the Susceptibility to Oxidation: The Manometric Method: Description and Examples."
(37) H. P. Stevens and R. Gaunt, "Aging Experiments with Latex-Treated Fabric."
(49) J. P. Griffiths and C. R. Pinnell, "Methods of Evaluating Durability of Rubber Thread."
(52) J. A. Robertson, "Effect of Aging on the Water Absorption of Vulcanized Rubber."
(53) W. J. S. Naunton and J. R. S. Waring, "Fatigue in Rubber. Part II."
(61) B. Marzetti, "An Accelerated Aging Test at Room Temperature."
(64) H. Roelig, "Dynamic Evaluation of Damping and Durability of Vulcanized Rubber."
(65) C. M. Doede, "A Relationship between the Critical Oxidation Potentials and Antioxidant Activity of Rubber Antioxidants." *
(67) J. R. Scott, "Comparison of Accelerated and Natural Aging under Various Conditions."
(69) L. B. Morgan and W. J. S. Naunton, "Mechanism of Oxidation of Rubber and Its Bearings on Accelerated Aging Tests. Parts I and II."
(75) S. Oberto, "Aging Fluorescence of Vulcanized Rubber."
(76) H. Bradley, "The Bursting Form of Test Applied to Rubber and Rubberized Materials."
(87) F. B. Jones and W. H. Pearce, "The Use of the Pendulum in Rubber Testing."
(92) J. H. Carrington, "The Testing of Rubber at Low Temperatures."
(101) C. M. Blow, "The Aging of Rubber in Relation to Its Textile Applications (with Particular Reference to Wool)."
(103) A. van Rossem and P. Dekker, "Oxidation Products of Vulcanized Rubber."

Applications

(3) H. Kjolsen, "Danish Tire-Market Organization."
(13) C. Krauz and I. Franta, "Study of Oil Varnishes Containing Rubber."
(41) J. Forster and F. Lion, "Some Problems in the Cable Industry."
(45) A. Hay, "The Uses and Possibilities of Rubber in Agriculture."
(47) K. Oeser, "Rubber as a Spring Material."
(48) A. M. Jamey, "The Use of Rubber in the Manufacture of High-Tension Cables."
(68) W. H. Gibson, "The Applications of Rubber Associated with the Linen and Sisal Industries."
(74) P. Petithuguenin, "Rubber in Agriculture in France, and the Propaganda Centre of the Institut Français du Caoutchouc."
(84) H. Heering, "High-Tension Rubber Cables."
(88) J. K. Ebblewhite, "Some Developments and Problems in Elastic Weaving."
(94) W. Davis, "Some Problems in the Use of Rubber Threads in Knitted Textiles."
(95) G. Venosta, "Recent Progress in Heavy Motor-Vehicle Tires."
(99) H. Barron, "Rubber Plastics."
(100) S. A. Brazier, W. Holland-Bowyer, and C. E. Mellers, "An Investigation of the Performance of Flat and V-Type Transmission Belts."

Compounding Materials

(18) I. Drogin, "A Survey of Methods for Evaluating Carbon Blacks." *
(29) G. Bruni and T. G. Levi, "Manufacture of Blacks of the Carbon Black Type from Materials Other than Natural Gases."
(33) W. B. Wiegand and J. W. Snyder, "Rubber Vulcanizing Properties of Colloidal Carbons." *
(54) G. L. Roberts, "Use of T-50 Test for Evaluating Rate of Vulcanization of Carbon Gas Blacks." *
(55) P. Alexander, "Methods of Reclaiming Rubber Employed during the Past Hundred Years."
(57) R. G. R. Bacon, E. H. Farmer, and P. Schidrowitz, "The Incorporation of Polymeric Resins into Natural Rubber."

Latex

(16) A. R. Kemp, "Composition and Colloidal Properties of Balata Latex." *
(25) R. J. Noble, "Purified Latex and Rubber." *
(38) C. M. Blow, "The Modification of the Colloidal Characteristics of Rubber Latex."
(39) W. H. Willott, "Color Measurement and Its Application in the Rubber Industry."
(43) E. A. Hauser and M. Bender, "Survey of the Electrokinetics of Rubber Latex." *
(51) H. F. Jordan, "The KOH Number Test and Its Application to the Compounding of Zinc Oxide in Rubber Latex." *
(58) C. F. Vester, "Note on the Mechanism of Creaming of Latex."
(60) D. F. Twiss and A. S. Carpenter, "The Composition and Characteristics of the Rubber in Hevea Latex."
(72) E. A. Murphy, "Testing and Control of Latex Supplies."
(73) H. C. Baker, "Preparation and Properties of Halogen Derivatives of Rubber from Latex."
(82) C. F. Flint, "The Testing of Latex Chemicals for Effect on Vulcanization Solvent Resistance and Fluid Stability."
(85) A. van Rossem and J. A. Plaizier, "The System Latex-Colloidal Clay. II. Further Investigations on the Influence of Colloidal Clay in Rubber."

Plantation Subjects

(1) E. de Wildeman, "Study of the Constitution of Latices in Relation to the Life of Plants."
(4) O. de Vries, "Tackiness and Consistency of Rubber after Treatment by Alkali."
(11) V. Cayla, "The Variability of Raw Rubber."
(28) J. D. Hastings, "Plasticity and Color of Sheet Rubber."
(62) P. J. S. Cramer, "Grading Young Rubber Plants with the 'Testatex' Knife."
(70) H. R. Braak, "Durability in Connection with Gutta Percha and Balata."
(93) B. J. Eaton, "Some Problems in Relation to the Production of Latex and Rubber on Estates."

Synthetic Rubber-like Materials

(40) E. Badum, "The Use of Synthetic Rubber ('Buna') as an Insulation for Submarine Cables."
(78) M. Jones, "The Vulcanizing Properties of Neoprene."
(81) T. L. Garner and J. Westhead, "Some Oil-Aging Properties of Synthetic Rubber-like Materials."
(86) P. Stöcklin, "The Development of Swelling-Resistant Rubber-like Materials in Germany."
(102) G. von Rosenberg, "Synthetic Materials with Rubber-like Properties."

* Abstract of this paper appears in June issue.

The Conference Banquet

Presiding was the Rt. Hon. Viscount Hailsham, Patron of the Conference, who was accompanied at the head table by S. T. Rowe, president, I.R.I.; Sir George Beharrell, immediate past president; Sir Harry Lindsay, director, Imperial Institute; Eric Macfadyen, past president, I.R.I.; F. D. Ascoli, chairman of the council, I.R.I.; Prof. G. Bruni, of Italy, and a number of others among whom were the following Americans; R. P. Dinsmore, A. R. Kemp, N. Bekkedahl, and L. A. Wood.

A toast by Sir Harry Lindsay to "the Institution of the Rubber Industry" extolled the Institution and was responded to by S. T. Rowe, who thanked those who had contributed so largely to the success of the conference. Sir George Beharrell proposed the health of the overseas delegates and foresaw the benefits from contact by rubber technicians and praised the efforts of the International Rubber Regulation Committee. Prof. G. Bruni responded for the delegates and, after interspersing his remarks with wit, spoke of the great strides in the past 20 years, particularly regarding the progress from wild rubbers to even synthetic rubbers. He also paid tribute to leaders in the British rubber industry.

Mr. Macfadyen then proposed a toast to the health of the guests in a fitting and humorous speech and asked R. P. Dinsmore to respond. Mr. Dinsmore very aptly spoke of the great hospitality and Government Reception as a token of recognition of rubber technology. He said the organizers of the conference through their efficiency

had created a new instrument for the propagation of technical knowledge, and at Mr. Dinsmore's invitation the guests rose as a token of their gratitude and esteem for their hosts.

Rubber in Netherland India

(*Continued from page* 40)

this difference in area. In 1924, according to figures in Table 5, exports of native rubber exceeded those of the estates in the Outer Provinces; the rubber exported in 1924 must have been from trees laid out no later than 1918.

The first reliable data on the extent of the native plantings in all rubber districts of the Outer Provinces became available in 1936 when a census was taken of the rubber trees. From the number of trees and the density it was calculated that the native rubber holdings occupied an area of 681,000 hectares, of which 630,000 hectares were tappable. In the same year the area of the estates in the entire Netherland India was 596,000 hectares. Thus in the course of 30 to 35 years, both the estate and native *Hevea* cultivations have grown together to approximately the same total size in area.

Conclusion

For 1936, rubber areas in the principal rubber producing territories were as follows: native holdings in the Outer Provinces, 681,000 hectares; estates in entire Netherland India, 596,000 hectares; total of these two, 1,277,000 hectares; total (estate and native) in Malaya, 1,309,779 hectares.

From the foregoing discussion it is clear that if the question were to be raised as to who should be held responsible for the overproduction of rubber noted after 1930, the blame should certainly not be placed on the native rubber cultivation of Netherland India alone, but also on the estate cultivation in Netherland India and on the estate and native cultivation in Malaya.

Rubber Goods Exports Up

April exports of rubber goods, value $2,546,923—the highest peak since October, 1937—were 10.8% less than the value for April, 1937, but 9.7% above that for March, 1938. Exports of 23,552 truck and bus casings, value $477,553, revealed increases of 45.4% in volume and 51.4 in value, compared with April, 1937, and 20.5 and 23.7%, respectively, compared with March, 1938. Exports of 59,954 other auto casings, value $585,570, were 20.3% less than for April, 1937, but were 29.3 in volume and 20.5 in value greater than March exports. The volume of auto inner tube exports, numbering 49,387, was 19.5% less than that for April, 1937, but 13.3% greater than for March, 1938.

Compared with April, 1937: exports of 64,996 pairs of canvas rubber-soled shoes, value $42,804, were 67.2% greater in volume and 96.2% greater in value; those of rubber and balata belting, other than auto, were 18.5 and 17.3%, respectively, less; shipments of hose and tubing, other than garden, were 6.8 and 18.9% less; reclaimed rubber exports fell off 62.7% in volume—an expected reaction to the low price of crude rubber; and scrap rubber was 25.6% less than the volume exported during the same period last year.

April imports of rubber manufactures, value $89,443, were 57.5% less than the value of rubber goods imported in April, 1937, and 10.5% under the figure for March, 1938. Imports of rubber-soled footwear with fabric uppers, 80,227 pairs, value $15,413, were 25.9% in volume and 53.4% in value less than those for the same period last year. Imports of 74,835 tennis balls, value $7,696, were 36% in volume and 45.2% in value greater than for April, 1937. *Commerce Reports.*

Editorials

Railroads and Industry

TRANSPORTATION of raw materials and finished goods is essential to the conducting of an industrial business. Railroads have been and will continue to be an essential means of transportation. While automotive trucks have acquired an important place in the system of transportation, their scope will undoubtedly remain limited, and there will continue the need of railroads.

In view of the fact that railroad management is not free to establish the selling price of its product, which is transportation, any reduction in the usage of their services must be compensated for by a reduction in their operating expenses. Because of the large investment in roadbed and the necessity of maintaining the condition of the roadbed equally well for a lesser number of trains, the possible decrease in operating cost is not in proportion to a decrease in the number of trains or the number of cars. Assuming that the organization is functioning efficiently, and if a proper balance is to be maintained between income and expenses, the only complete remedies lie in the elimination of right-of-way through abandonment or consolidation of competing lines or through a reduction in wages. Owing to the element of safety, a reduction in operating personnel cannot be resorted to in any appreciable degree unless the functions are eliminated.

Another point of questionable fairness is the fact that competing trucks can use the public highways without charge except for license fees. One might reasonably raise the point as to the equity between the license charge for trucks and the investment and maintenance cost for a railway roadbed.

If the total output of railroads is calculated on the basis of one passenger-mile being the equivalent of three ton-miles, there is evident a marked decrease in output units during the past 20 years for the Class I railroads and at the same time a large increase in wages paid. In 1916 the total output was roughly 466,200,000,000 units; wages paid were $1,468,576,000; output per $1 of wages was 317 units. In 1936 the total output was roughly 406,560,000,000 units; wages paid were $1,848,635,000; output per $1 of wages was 220 units.

In contrast to truck operators or government ownership, privately owned railroads are an asset as taxpayers, for if this source of revenue were eliminated, industry and private individuals would be forced to compensate for that deficit. In 1936 Class I railroads paid $320,000,000.

While there has been much discussion of the railroad problem, the present attitude appears to be one of letting them meet a natural death. Inasmuch as regulation along lines already effective prevents unreasonable rates, is it not practical to permit consolidation of competing lines and substitution for unimportant lines by trucks and buses so as to reduce the scale of operation to a point that would be commensurate with the total potential business and thus permit profitable operation of the remaining lines? This problem deserves the attention of individuals as it is of real public interest.

Rubber Regulation

THE history of the attempts of the International Rubber Regulation Committee to maintain a uniform fair price of rubber discloses a series of accentuated changes in the per cent. of permissible shipments. These fluctuating percentages are indicative of the inability to foresee the variations in business activities. Because of the fact that under the present scheme of regulation, effective changes in permissible shipments must lag several months behind the consumer demand, it is apparent that wide changes must be made in order to offset the increase or deficit in inventory accumulated before the altered percentage can become effective.

This constantly fluctuating rate of allowable shipments does not prevent high and low spots in the market prices. Also, this condition makes impossible the steady operation of plantations, which necessitates intermittent employment to the extent that when increased production of rubber is desired, a shortage of trained laborers often occurs. In 1936 the fulfilment of increased permissible shipments was delayed by a shortage of labor, and unreasonably high prices resulted.

From experience during the operation of the present scheme it appears that a further leveling method is necessary in order to compensate the peaks and depressions in consumption which are probably inevitable. Therefore some sort of controlled intermediate supply is needed. The successful operation of a pool or quantity of produced rubber, stored and regulated between the points of production and ultimate purchase, involves many details and is predicated on a complete agreement by all factions as to the objective and basis of its operation.

In order to make such a plan workable it would seem highly important that all affected parties should extend their efforts in a cooperative attempt to give full consideration to their various interests.

S. C. Stillwagon

EDITOR

What the Rubber Chemists Are Doing

A. C. S. Rubber Division Activities

Fall Meeting in Milwaukee

THE Rubber Division, A.C.S., will hold its fall meeting on Wednesday and Thursday, September 7 and 8, at the Plankinton House, Milwaukee, Wis., in conjunction with the ninety-sixth meeting of the American Chemical Society to be held during the week of September 5. Members planning to attend are urged to make their reservations as promptly as possible.

Owing to the extensive amount of work handled by the secretary-treasurer, C. W. Christensen, the Executive Committee has decided to divide the duties of the secretary and the treasurer. H. I. Cramer, of the University of Akron, Akron, O., has been appointed by A. R. Kemp, division chairman, to serve as secretary until the next election of officers. Mr. Christensen will continue as treasurer.

The deadline for receiving papers to appear on the fall program will be July 14. Papers should be sent to the new secretary, Mr. Cramer; four copies of each paper must be submitted, together with an abstract of the paper of 200 words or less. Those intending to submit papers are requested to notify Mr. Cramer of their intention as soon as possible.

New York Group Outing

APPROXIMATELY 150 members and guests attended the annual outing of the New York Group, Rubber Division, A.C.S., held at Karatsonyi's Hotel, Glenwood Landing, Long Island, N. Y. on Saturday, June 11. A showery forenoon which did not discourage those attending was followed by bright sunny weather in the afternoon, and the affair, although with smaller attendance, was generally conceded to be one of the most successful ever held by the group. At noon a cold plate luncheon was served, after which the numerous sporting events were held; the program was concluded with an excellent chicken dinner in the evening.

Soft ball games were played between pick-up teams with sufficient amateurs to provide the spectators with amusement. The games were ably handled by a staff of umpires, although some of their decisions met with considerable good-natured disapproval. The scores follow: Single Men 16, Married Men 15; Peddlers 16, Chemists 3; and in the elimination contest, Single Men 3, Peddlers 1. The winning team comprised Messrs. Cosler, Eckhardt, Hamer, Jackson, Provost, Robertson, Scoville, Shulberg, Smythe, and Vila.

Top honors in golf went to H. B. McCreary, United Carbon Co., for low gross and low net; H. D. Bainbridge, Anaconda Wire & Cable Co., won the kickers' handicap; while S. W. MacKenzie had the high score.

The other sporting events and their winners follow: Baseball Throw—M. Wishnick, Continental Carbon Co., and L. T. de Lorme, Clark Realty Co.; Fat Men's Race—M. E. Lerner, *Rubber Age;* Backward Race—M. Wishnick; Flyweight's Race—F. Conover, Naugatuck Chemical; Horseshoe Pitching—W. Lamella, The Okonite Co., and M. R. Buffington, Lea Fabrics, Inc.; Boccie—R. Symons, Canada Wire Co., and M. F. Torrence, E. I. du Pont de Nemours & Co., Inc. The tug-of-war was won by a team composed of Messrs. Braun, Duntze, Eckhardt, Lerner, Osberg, Ottenhof, Rea, Scott, and Warner.

During dinner prizes, supplied by the group itself and consisting of bottles of liquor and tins of cigarettes, were distributed to all winners. The outing committee members were thanked by C. A. Bartle, group chairman, for their efforts in assuring the success of the outing. Preference for Karatsonyi's as an outing spot was indicated by the members and guests present.

The outing committee comprised: Charles R. Haynes, Binney & Smith Co., chairman; D. C. McRoberts, Kaysam Corp. of America, master of ceremonies; B. B. Wilson, INDIA RUBBER WORLD, and J. M. Ball, R. T. Vanderbilt Co., tug-of-war; H. Bimmerman, E. I. du Pont de Nemours & Co., Inc., and S. C. Stillwagon, INDIA RUBBER WORLD, soft ball; W. O. Hamister, Naugatuck Chemical Division of United States Rubber Products, Inc., T. Callahan, Wishnick-Tumpeer, Inc., M. R. Buffington, Lea Fabrics, and W. Lingvall, U. S. Rubber Products, races and contests; W. F. Lamella, Okonite Co., horseshoe pitching; J. H. Carroll, R. E. Carroll, Inc., Boccie; H. B. McCreary, United Carbon Co., golf.

Akron Group Outing

THE summer outing of the Akron Group, Rubber Division, A.C.S., was held on June 17 at the Silver Lake Country Club. The affair, attended by 330 members and guests, was a decided success. J. Waite, of the Dugan Campbell Co., acted as general chairman; while R. S. Taylor, Firestone Tire & Rubber Co., was in charge of golf, and S. Cartledge, Midwest Rubber Reclaiming Co., handled the prizes. Walter Voth, Akron Standard Mold Co., was master of ceremonies at the golf course and at the prize drawing. Among those assisting and taking a prominent part in the festivities of the day were: G. Allison, The B. F. Goodrich Co.; A. E. Warner, new group chairman, of the C. P. Hall Co.; R. Laporte, The Seiberling Rubber Co.; R. Seeds, The Goodyear Tire & Rubber Co., Inc.; C. Moore, Philadelphia Rubber Works; and F. Bonstead, Binney & Smith Co.

Golf was the feature of the day with 101 participating in the tournament. The golfers were assisted off the first tee by Mr. Voth and his assistants with a loud speaker, guns, snakes, balloons, rattlers, etc. The same peaceful facilities were provided at the eighteenth hole; while refreshments were provided at the ninth hole.

During the dinner approximately 100 prizes were distributed to golf winners and those who held winning tickets. The prizes were made possible through the generous donations of some 60 companies. Chief prize winner was E. K. Markle, Firestone, who won two golf prizes and the first drawing prize, a leather traveling bag.

Los Angeles Fishing Trip

THE annual deep-sea fishing trip of the Los Angeles Group, Rubber Division, A. C. S., will be held Saturday, July 23, out of San Diego harbor. Indications are that the event will be well attended, according to Ed Royal, H. M. Royal Co., who is in charge of arrangements.

Back Issues Wanted of "Rubber Chemistry and Technology"

THE Rubber Division of American Chemical Society has announced through Treasurer C. W. Christensen, in care of Monsanto Chemical Co., 1012 Second National Bldg., Akron, O.,

that its stock on certain back numbers of *Rubber Chemistry and Technology* is completely exhausted. Consequently the treasurer has been authorized by the executive committee to offer the following prices on back issues in good condition: Vol. 1, No. 1, Vol. 2, Nos. 1 and 2, Vol. 3, No. 2, $2.50 each; Vol. IX, No. 4, Vol. X, No. 1, and Vol. XI, No. 1, $1.00 per copy. If any of our readers have extra copies of these issues, please send them to Mr. Christensen, who will remit a check by return mail.

Rhode Island Rubber Club

THE summer meeting of the Rhode Island Rubber Club featuring a golf tournament was held on June 3 at the Wannamoisett Country Club, Rumford, R. I. In the afternoon 69 golfers took part in the tournament; while at the dinner and meeting that followed in the evening 120 members and guests were present. The committee in charge of the affair comprised: C. Berlow, F. E. Rupert, and D. C. Scott, Jr.

Officers for the coming year were elected at the meeting as follows: president, Charles Berlow, American Wringer Co.; secretary-treasurer, D. C. Scott, Jr., Henry L. Scott Co.; executive committee, E. L. Hanna, Davol Rubber Co.; F. D. Chittendon, United States Rubber Products, Inc.; Arthur Davis, Goodyear Footwear Corp.; S. J. Lake, Respro, Inc.; John Marshall, Collyer Insulated Wire Co.; Gladding Price, R. T. Vanderbilt Co.; Carl Short, U. S. Rubber Products; H. E. Thompson, Anaconda Wire & Cable Co.

Following the dinner and election of officers 36 prizes were distributed, 21 to winners in the golf tournament and the remainder to lucky ticket holders. Those receiving top honors in golf were: low gross (members), E. M. Rupert; low gross (non-members), H. D. Bainbridge; low net, R. Edson; blind bogey, F. Fitspatrick. The program was concluded by the presentation of the motion picture "Rubber Reborn," by William Welch, president of the Midwest Rubber Reclaiming Co.

Prizes distributed at the meeting were made available through donations of the following companies: Akron Standard Mold Co., American Zinc Sales Co., Anaconda Sales Co., L. Albert & Son, Ault & Wiborg, Binney & Smith Co., Carter Bell Mfg. Co., Continental Carbon Co., E. I. du Pont de Nemours & Co., Inc., Wm. Egleston & Co., Farrel-Birmingham Co., Inc., General Atlas Carbon Co., C. P. Hall Co., Halowax Corp., INDIA RUBBER WORLD, Industrial Paper & Cordage Co., Ernest Jacoby & Co., Moore & Munger, H. Muehlstein & Co., Inc., National Rubber Machinery Co., Naugatuck Chemical Division of United States Rubber Products, Inc., New Jersey Zinc Co., Pequanoc Rubber Co., *Rubber Age*, Rubber Service Division, Monsanto Chemical Co., A. Schulman, Inc., Stamford Rubber Supply Co., William R. Thropp & Sons Co., Titanium Pigment Corp., United Carbon Co., U. S. Rubber Reclaiming Co., R. T. Vanderbilt Co., L. G. Whittemore & Co., C. K. Williams & Co., Charles T. Wilson Co., Inc., and Wishnick-Tumpeer, Inc.

Colloid Symposium at M.I.T.

The Fifteenth Colloid Symposium, sponsored by the Division of Colloid Chemistry, A.C.S., was held from June 9 to 11 at the Massachusetts Institute of Technology, Cambridge, Mass. under the chairmanship of Dr. Ernst A. Hauser, well-known latex authority. Twenty-five papers were presented and discussed at the symposium.

Bronze Lacquer for Rubber Goods

A special clear lacquer, known as Dulac Rubber Bronze Lacquer No. 8, makes it possible to cover semi-stiff rubber with a strongly adherent, durable finish resembling brass, copper, bronze, aluminum, steel, or other metals. To give the desired metallic effect the powder of the proper color is added to the clear lacquer just prior to its use. Application is by spray only, and it is claimed that one gallon will cover approximately 150 square feet.

Tests on Neoprene Insulated Wire

THE efficiency of a Neoprene sheath for ignition cable was illustrated by a series of tests conducted by the Packard Electric Division, General Motor Corp., Warren, O. A sample of cable with a Neoprene sheath, together with five different samples of ordinary cable, were first submerged in oil at 200° F. for 24 hours. Next, the six samples were placed in an oven at 210° F. for 76 hours. This was followed by another submerging in oil at 200° F. for 24 hours, after which the six samples were placed in salt water at room temperature for 24 hours. Finally, they were returned to the oven where they were heated at 250° F. for 15 hours.

Ignition Cables After Testing

After each successive stage of the test, the samples were wrapped on one-inch mandrels to test for flexibility. As illustrated, all cables cracked except the one protected with Neoprene (shown in lower right corner), four failed after the second stage of the test, and the other after the fifth stage. The Neoprene-jacketed cable maintained its original flexibility and showed no signs of cracking even when bent on a ½-inch mandrel after the test.

Other samples of the same cables were also subjected to an electrical test. Three cables failed at 10,000 volts, and two failed when the voltage was raised to 15,000. The Neoprene-covered cable withstood 10,000 volts for one hour, 15,000 volts for one hour, and 20,000 volts for three minutes.

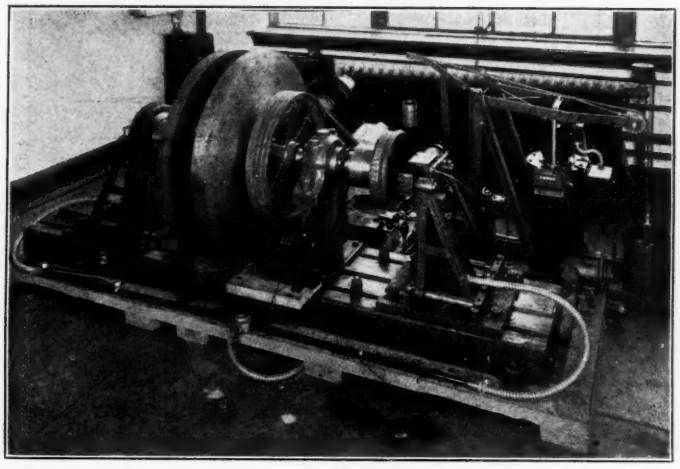
New Monsanto Accelerator

"Santocure," a new accelerator, is a recent development of the Rubber Service Laboratories Division, Monsanto Chemical Co., Akron, O. The new accelerator, which is in the same classification as the firm's "Ureka"-type accelerators, is said to have as its chief advantage ease of handling throughout the plant. A basic accelerator (guanidines, aldehyde amines, etc.) is required for the activation of "Santocure;" however combinations of 50% "Santocure" and 50% DPG can be handled easily in all usual factory work.

Hutex Emulsion for Latex

This material, made in England, is reported to be a dispersed factice and is composed of 70% of vulcanized pure vegetable oil; as sold, its physical state is a slightly fluid paste, light brown in color and very stable to all kinds of processing. It mixes readily with latex in large proportions and increases the stability of latex mixings. Relatively large amounts of the emulsion can be added to the latex without affecting the ultimate tensile to any great extent, but the material has a profound effect on the modulus of cured latex products, making them much more extensible. This has special application for such latex goods as rubber gloves, etc. Another advantage claimed is that it acts as an extender for latices and enables the latex to take up a larger proportion of fillers without serious detriment to the ultimate properties. The material cannot be used in brightly colored latex goods. Twenty-five per cent. of this material added to latex will give a very pale buff film. One hundred per cent. addition produces a clear dark-brown semi-transparent film.

New Machines and Appliances



Brake Lining Tester

Vibration Pickup

Neobeam Oscilloscope

Machine for Testing Brake Linings

TO SIMPLIFY the work of revising the Federal Government's specification for automobile brake linings, a new testing machine was recently installed at the National Bureau of Standards. Although similar in method of operation to previous testers, the new machine has incorporated in its design features suggested by members of the Brake Lining Manufacturers Association.

A horizontal shaft carries a brake drum at each end with a pulley and flywheel near the midway point; the pulley is driven by a motor through a multiple V-belt. Metal disks can be added to or taken from the flywheel to change its weight. Thus the inertia of the system can be varied to reproduce that of any given automobile with a weight of 3,600 or more pounds. The lining samples, which have an area of eight square inches, are forced against the drums by internal shoes, operated by hydraulic brake cylinders.

The operation of this tester consists essentially of rotating the flywheel at a predetermined speed, shutting the power off, and bringing the flywheel to rest by centrifugal pressure through one of the two brake mechanisms. The equipment is designed for automatic operation with the following cycle: (1) the circuit which starts the motor is closed; (2) at the desired speed the motor circuit is broken, and the thruster circuit (operating one of the hydraulic brakes) is closed; (3) when the flywheel comes to rest, the thruster circuit is broken and the brake released; (4) a motor shifts a two-way valve to the brake which is to operate on the next cycle. The cycle may be repeated at any desired time, but the usual procedure is to use one minute intervals.

A speed recorder operated from a tachometer records the speed of the flywheel which is used to calculate the deceleration of the flywheel and from this the friction of the brake lining. The tachometer circuit is also used to operate a vacuum circuit which controls the main motor and the brakes. Experiments are now being conducted to determine how different linings perform and how the equipment may best be adapted to brake lining specification use.

Vibration Study Apparatus

THE Neobeam Oscilloscope is a highly sensitive instrument which can be used for measuring the vibration absorption characteristics of rubber. In determining the effectiveness of rubber in damping out vibrations, the new apparatus measures both amplitude and frequency of vibration. The Oscilloscope contains a built-in amplifier which modulates a neon column constantly excited by radio frequency. The fluctuations of the neon column are observed in a scanning mirror, thus showing the exact wave pattern of the vibration under observation. A calibrated control synchronizes the scanning mirror to the frequency observed, thus permitting direct frequency determinations. A voltmeter, indicating the relative amplifier output, is used to compare vibration and modulation levels.

A vibration pickup instrument used in conjunction with the Oscilloscope, when held against a vibrating body, will generate electrical impulses of a wave form corresponding exactly to that of the vibrating motion. Sundt Engineering Co.

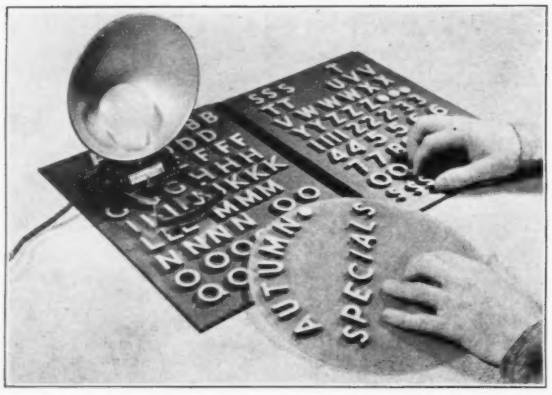
Vacuum-Packed Welding Electrodes

BY PACKING welding electrodes under a vacuum in a hermetically sealed metal container, spoilage upon storage is materially reduced. Deterioration is normally due to moisture coming in contact with the sodium silicate, present as an electrode binder. The silicate, having a natural affinity for moisture, absorbs moisture from the air and thereby loses its adhesive quality. The electrodes are now taken from the drying ovens and immediately sealed in their containers, providing "oven-fresh" electrodes regardless of conditions or time of storage. Harnischfeger Corp.

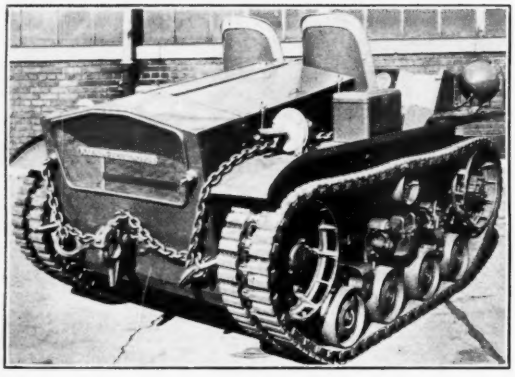
Penetrating Agents

Penatrols, combinations of sulphonated alcohols and sulphonated fatty acids of the aryl groups, are for use as wetting-out and penetrating agents where higher cost sulphonates are uneconomical. These chemicals are of particular interest to paper manufacturers for: impregnation of paper, particularly with latex; defiberizing of lap pulp, and removal of ink from old paper. Penatrols are also used in the manufacture of textiles, leather, latex products, and agricultural sprays.

New Goods and Specialties



Spell-O-Tex Letters



Tractor Equipped with Rubber Tracks

Sponge Rubber Display Letters

SPONGE rubber letters with a gum rubber back which will adhere to any smooth surface form a strong, bold lettering, attractive to the eye and easily read at a distance. As the letters will not mar the surface, they can be applied directly to merchandise such as automobiles, refrigerators, and radios. They also may be used on smooth walls or glass show windows. A special application is in making titles for home movies wherein a suitable background scene is photographed through glass upon which the letters are mounted. The letters, which can be used over and over again, are made in three sizes: 1, 1½, and 2½ inches in height. Besbee Products Corp.

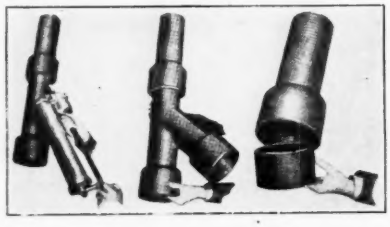
Synthetic Rubber Wipers for Machine Shop Equipment

OIL-PROOF wipers of synthetic rubber have been developed to replace felt wipers on lathes, planers, grinding machines, turret lathes, milling machines, and other machine shop equipment. The new wipers, which are tough and long wearing, will not absorb grit, metal chips, or abrasive material. Felt wipers have been found inadequate as they pick up pieces of metal and other particles which soon wear or score bearing surfaces. The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.

Rubber Pipe Joint

A RUBBER joint, known as PressureFlex, is a hollow cylindrical ring used for sealing grooved bell and spigot pipe ends. As the rubber is under compression when in use and not subject to direct contact with the liquids in the pipe, the joint may be used with pipes for handling corrosive liquids.

Oil-Proof Wiper



Installing PressureFlex Joint

When installing, the rubber ring is placed in the bell end of the pipe, and the spigot end of the next pipe section is inserted in place inside of the rubber ring. The joint has a small hole at the outer edge into which the needle point of a specially constructed injection gun is inserted; the gun inflates the joint with a special non-hardening sealing paste. The injection hole is then shut off by means of a special screw. The pressure exerted by the paste forces the rubber to grip the grooved pipe ends securely. Advantages claimed for the new joint include: flexibility; elimination of pouring pots and caulking; and reduction in installation time and labor costs. Maurice A. Knight.

Rubber Track Increases Mobility of Caterpillar Tractor

A JUDICIAL combination of the properties of a high-grade rubber compound, steel cables, and alloy steel in guides and driving members has resulted in a track which provides durability and efficient operation under formerly considered hazardous conditions and permits the operation of tanks and crawler-type tractors at speeds as high as 50 miles per hour.

The rubber track, a product of The B. F. Goodrich Co., is essentially an endless rubber belt reenforced longitudinally with steel cables and having disposed, at regular intervals, steel driving members. The cables and driving members are molded integrally in the rubber, providing strength and flexibility. Interlocking inside links, bolted to the driving members, form a continuous guide so that the track cannot come off under any conditions. The track is driven positively by means of a sprocket contacting with the guide links, thus eliminating any possibility of power loss through internal slippage.

Because of cable reenforcings, the strength of the track is very great; current models have a tensile strength of 60,000 pounds. Pitch-length is accurately maintained throughout the life of the track, and no provision need be made for stretch.

Longer life, high-speed operation, and lower power requirements (less than one-half) are some of the advantages this rubber truck is claimed to have over its steel competitor. In addition it will develop a higher draw bar pull than a steel track in sand, concrete, or a plowed field.

Rubber Industry in America

OBITUARY

Bruce W. Huling

BRUCE W. HULING, assistant manager of the automotive accessories department of The B. F. Goodrich Co., Akron, O., passed away on June 2, following a year's illness. He was born in Cleveland, December 7, 1876, and was graduated from Western Reserve University, Cleveland, in 1900. Mr. Huling was admitted to the Ohio bar in 1903.

He joined Goodrich on November 7, 1910, in the tire repair department. Four years later he was made an assistant divisional sales manager, and in 1921, after varied sales experience in Akron and the field was made branch manager for the company in Pittsburgh. On July 1, 1926, Mr. Huling returned to Akron as manager of the service department, a position he held until 1930, when he went to Buenos Aires, Argentina, as vice president and general manager of The Goodrich Rubber Co. of Argentina. After two years in South America he was sent to Johannesburg, South Africa as vice president and general manager of The B. F. Goodrich Co. (South Africa, Ltd.). Returning to Akron, February 1, 1934, he was on special sales work in the export division for one year and then went to the auto accessories department.

Mr. Huling was a 32nd degree Mason and a member of the Twenty-Year Service club of the Goodrich company.

He leaves his widow and two brothers.

Burial was in Lake View Cemetery, Cleveland.

C. F. Nicholas

C. FRED NICHOLAS, 69, a foreman with Davol Rubber Co., Providence, R. I., for more than 20 years, died suddenly, June 12. He is survived by his wife and one daughter.

A. E. Spear

ALBERT E. SPEAR died on May 23, 1938, at Naugatuck, Conn., after an illness of a few months. He was born on April 18, 1889. He was connected with the United States Rubber Co. since December, 1914, when he joined the organization at the American Rubber Co., Cambridge, Mass. During the 24 years he was associated with production control activities in central organizations of the U. S. Rubber Co. at New Haven, Conn., New York, N. Y., and Naugatuck, to which point he was transferred in 1929. He was a member of the Masonic Lodge.

DeBert Wakelee

DEBERT WAKELEE, for many years connected with the Lubron Co., Tileston St., Everett, Mass., where he manufactured mechanical rubber goods, died on June 6 at his home in Melrose, Mass. He was born in New Haven, Conn., June 23, 1874. He was unusually active in the Masonic order and also belonged to the Massachusetts Charitable Mechanics' Association, the Connecticut Commercial Travelers' Association, the National Association of Stationary Engineers, and several other organizations.

Surviving are his wife, a brother, and two sisters.

Funeral services were conducted on June 7. Interment took place at Shelton, Conn., the next day.

Michael L. Donovan

MICHAEL L. DONOVAN, for the last twelve years connected with the Cambridge Rubber Co., was killed in a New York street accident on June 2. The deceased was born in Rockland, Mass., 49 years ago. He was graduated from Harvard University in 1911.

For two years he was an efficiency man with the United Shoe Machinery Corp., Boston, Mass., and for a similar period was superintendent of the Rhody Shoe Co., Providence, R. I. The next three years were spent as superintendent and general manager of the South Shore Shoe Co., Rockland. During the World War, Mr. Donovan was a captain in the Officer's Corps, attached to the General Supply Depot, Boston, Mass. On June 1, 1919, he became manager of the shoe department and organizer of shoe exporting for the Federal Export Co., New York. Mr. Donovan also worked for the E. T. Wright Co., Rockland. At the time of his death he was district manager of the New York office, 125 Duane St., in charge of sales and also of southern branches of the Cambridge company.

Surviving are his wife and their son.

Funeral services were held on June 6 in Rockland, where interment took place.

FINANCIAL[1]

Unless otherwise stated, the results of operations of the following companies are after deductions for operating expenses, normal federal income taxes, depreciation, and other charges, but before provision for federal surtax on undistributed earnings. Most of the figures are subject to final adjustments.

Firestone Tire & Rubber Co., Akron, O., and subsidiaries, including the Firestone Auto Supply & Service Stores. Six months ended with April: net profit, $2,429,738, after deductions for depreciation, interest, federal income taxes, and other charges, equal to 53¢ a share on the outstanding common stock after providing for dividends on the 6% cumulative preferred stock, Series A. In the corresponding half of the preceding fiscal year the company earned $3,766,006, or $1.23 a common share.

S. S. White Dental Mfg. Co., Philadelphia, Pa., and subsidiaries. March quarter: net profit $10,315, equal to 3¢ each on 300,000 shares of $20-par capital stock, against $138,404, or 46¢ a share last year; net sales, $1,999,121, against $2,147,045.

[1] Dividends Declared on p. 76.

Lee Rubber & Tire Corp., Conshohocken, Pa. Six months to April 30: consolidated net profit after surtax, $314,105, equal to $1.23 each on 255,565 shares of $5-par capital stock excluding shares in treasury. This compares with $473,277, or $1.83 a share on 257,465 shares in six months to April 30, 1937.

To Test a Scaffold Plank

Block it up a foot from the ground placing the supports the same distance apart as the scaffold supports on which it is to be used. Now load the plank with three times the load it will be required to support in actual use placing load as close to the center as possible. At the slightest sign of weakness, discard the plank and mark it so no one else will use it as a scaffold plank. *National Safety Council, Inc., Safety Instruction Card No.* 15.

"EVERY FAILURE TEACHES A MAN SOMEthing if he will learn," remarked Charles Dickens. An accident is a failure. Are you learning the lessons these failures should teach you? *The Safe Worker.*

EASTERN AND SOUTHERN

THE approach of summer, it is reported, found business in the doldrums, with indications of somewhat lower levels. Although many factories have sharply curtailed factory operations, inventories remain high, particularly in relation to sales. It is believed that business will not show any real upturn before next fall.

Steel mills are operating at about 25% of capacity, and business in steel products is virtually stagnant. Demand from the automobile industry is slight, and no great call from this source is anticipated until production for new models begins. The seasonal decline in activity in the farm implement industry is another unfavorable factor for steel. No upturn in the steel industry is expected before late summer or early fall.

The building industry, however, is holding up better than most other lines. Some authorities, it is claimed, had felt that because of the huge deferred demand, a real revival in building should have been under way by now. The failure of this to materialize is attributed to lack of confidence in the future, high building costs, and excessive taxation. While the situation appears more hopeful than for some time past, it is too soon to draw optimistic conclusions.

Shoe manufacturers have cut production, as is customary this time of year. Production, less than that of a year ago, is figured to be below consumption. The trade expects a fair amount of fall business.

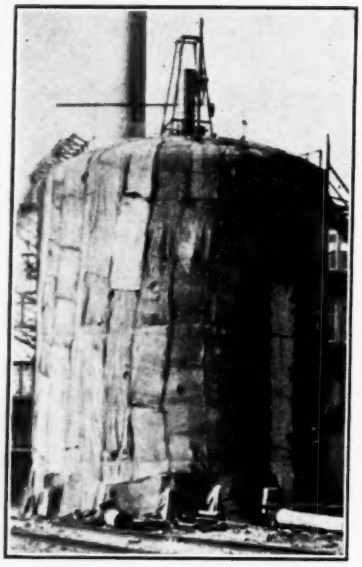
Early last month, however, a sharp contra-seasonal increase occurred in cotton mill activity, the index for which reached the high of the year.

Huge Hydrochloric Acid Tank Lined with Rubber

Believed to be the largest tank ever constructed for hydrochloric acid, the 120,000-gallon rubber-lined tank recently installed by Consolidated Chemical Industries at Ft. Worth, Tex., measures 26 feet in diameter and 25 feet in height.

Of welded steel plate construction, the tank was lined with a ⅜-inch thickness of Triflex rubber by The B. F. Goodrich Co., Akron, O. This lining, with built-in expansion joints to prevent cracking or buckling, has a three-ply construction embodying the advantages of both hard and soft rubber.

Owing to the size of the tank, it was necessary to install the lining in the field; the major problem in this connection was vulcanization. This was accomplished by insulating the outside of the tank with fabric, then filling it with water which was brought to the boiling point by injecting live steam



Hydrochloric Acid Tank Ready for Vulcanization

supplied by a portable boiler in conjunction with a railroad locomotive boiler.

Work Simplification Conference to Combat Waste

In announcing a Work Simplification Conference to be held at Lake Placid, N. Y., under the auspices of the Lake Placid Club Education Foundation from July 11 to August 20, Allan H. Mogensen said that two and one half hours of each employe's day in American industry are wasted and at 40¢ per hour represent an annual loss of $12,000,000,000.

Mr. Mogensen said, "This waste is caused by lack of interest of employes in their work, lack of knowledge of their job, resulting in waste of time, energy, and materials and that an increase in efficiency would materially help toward maintaining wage scales and employment."

"It is clear," he said, "that at no time have improvements thrown people out of work permanently. They have dislocated people, they have changed their employment, but we cannot get away from the truth—the lower the cost of production, the more people can buy of industry's products, and the wider will be their distribution. Hence, more work will be made and more people employed.

"Waste causes high prices. Waste in production and distribution is the enemy of the consumer's dollar. . . .

"Every time that the consumer pays more than the most scientific methods of production and distribution require, there will be less buying than there might have been, with consequent less employment and a further shrinkage of the consumer's dollar.

"The answer to the present economic situation is not more money for the products produced, but more products for the money which is available."

A. Schrader's Son, Division of Scovill Mfg. Co., Inc., 470 Vanderbilt Ave., Brooklyn, N. Y., is conducting a campaign stressing "Self Air Service" for farmers. Aimed at owners of pneumatic tired farm vehicles who do not take their tractors and farm vehicles to a service station for necessary servicing, the campaign makes use of a distributer salesman's "Farm Selling Plan," which explains national farm advertising and sales promotion on Schrader products effective from May through October, and a booklet for farmers, entitled "Tractor Traction," which lists farm tire self-service tools including spark plug pumps, water adapter, tire gages, and tire valve cores and caps.

Callaway Mills, La Grange, Ga., manufacturer of textiles, including those for the rubber industry, has announced the resignation of Cason J. Callaway as chairman of the board. Fuller E. Callaway, Jr., active managing head of the concern for the last several years, will continue as president. Robert D. Williams, Jr., was elected vice president in charge of all sales. He was recently head of the company's New York, N. Y., office, and was formerly in charge of consumer sales, with headquarters at 345 Madison Ave., where he will remain.

Excise Tax on Sporting Goods Repealed

When President Roosevelt allowed the tax bill to go into effect midnight May 27 without his signature, his action led to the repeal of the excise tax on sporting goods (Section 609) as of midnight June 30. Thus any such articles sold thereafter will not be subject to the tax.

Included in Section 609 of the Revenue Act of 1932 was a tax, payable by the manufacturer, equivalent to 10% of the selling price of many sporting goods items including tennis rackets and strings, racket covers, snowshoes, baseball shoes, football helmets, harness, and uniforms, golf bags and clubs, balls of all kinds including baseballs, footballs, tennis and golf balls, and games (excluding those for children).

Articles not subject to the tax included gymnasium and playground equipment, children's toys and games, and articles which by reason of their

general use for other purposes, such as (unless sold as part of a uniform) bathing suits, plain rubber-soled shoes, hose, belts, and similar products.

Barber Asphalt Corp., Philadelphia, Pa., has appointed Howard V. Smith chief chemical engineer, and J. Strother Miller, Jr., formerly director of the technical department, has become technical adviser.

American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York, N. Y., recently purchased a site in Mobile, Ala., for the construction of a chemical plant, work on which will be started immediately. The chief product will be sulphate of alumina, used for water purification and in manufacturing paper. The company has also secured land in Savannah, Ga., where it will erect a plant for the manufacture of miscellaneous heavy chemicals.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced the resignation of Research Chemist Elmer O. Kraemer, who has been awarded a research fellowship of $2,500 by the Lalor Foundation to continue his studies of the size and the shape of giant molecules, for example, molecules of rubber, proteins, cellulose, etc. Dr. Kraemer will conduct his investigations in the laboratory of The Svedberg at the University of Uppsala in Sweden. Besides he will visit the outstanding European research centers for physical and colloid chemistry, to study their research and educational facilities.

Bibb Mfg. Co., manufacturer of cotton textiles, Macon, Ga., through President Wm. D. Anderson has announced that at a recent meeting Scott Russell, for several years general counsel for the company, was made executive vice president and a director. At the same time Mills B. Lane, Jr., was named to the board to fill a vacancy caused by the death of Samuel B. Adams. Other company executives are Mr. Anderson, president and chairman of the board; James H. Porter, vice chairman of the board; A. A. Drake, vice president and secretary; Charles C. Hertwig, treasurer; H. J. Bivins, assistant treasurer; and O. S. Neylans, assistant secretary. Bibb maintains branches at 74 Leonard St., New York, N. Y.; 1074 Merchandise Mart, Chicago, Ill.; 787 Drexel Bldg., Philadelphia, Pa.; and 707 United Bldg., Akron, O.

United States Department of Labor, Washington, D. C., recently announced the awarding of contracts for supplies, valued at $9,719,163, by 14 federal agencies under provisions of the Public Contracts Act. Included among the successful bidders were: Endicott Johnson Corp., Endicott, N. Y., overshoes, rubber top, $15,360, for CCC, and Goodyear Rubber Co., Middletown, Conn., boots and overshoes, $10,881, for CCC.

U. S. Rubber News

F. B. Davis, Jr., chairman of the board of directors and president of the United States Rubber Co., 1790 Broadway, New York, N. Y., announced that Harry E. Humphreys, Jr., of Wilmington, Del., for many years associated with Christiana Securities Co., which is controlled by the du Pont family, was elected a director member of the finance committee, and vice president of U. S. Rubber, at the regular monthly meeting of the board on June 1, to succeed William de Krafft, who retired June 30.

Mr. de Krafft sailed late last month on a European trip, to return early in October, when he will open a private office at 16 Wall St., New York.

New Rayon Tire Cord

Of great significance to America's cotton farmers is news from United States Rubber Products, Inc., that the company's new rayon cord used in truck tires is entirely a cotton product. Ordinarily rayon is manufactured from cellulose derived from wood pulp. But in the case of the U. S. Raymaster truck tire, the rayon is made 100% of cotton.

It is pointed out that where previously it has been necessary to use an imported cotton to obtain the necessary cord strength, this is now obtained by chemically processing a domestic farm product.

Except for its silky surface, the new cord appears much the same as conventional cotton cord. It is twisted by the same processes in the same factories—at Winnsboro, S. C., Hogansville, Ga., and Shelbyville, Tenn.,—in which all U. S. tire cord material is manufactured. But here the similarity ceases. The strands which make up each rayon cord are of continuous length. They are not spun from shorter fibers. Each strand runs the length of the cord, and being of uniform gage throughout its entire length, is free from the friction caused by uneven strands rubbing against each other.

G & J Sound Slide-Film

Drawing a parallel between the past and the present, a new commercial sound slide-film, "New Roads to Profit," has been released by the G & J Tire Co., 1790 Broadway, New York. Pointing out that reputable men and sound merchandising principles are immune to changing times, the film shows that G & J's products and modern merchandising methods take their roots in the sound principles upon which the company was founded.

The film's opening scene shows Thomas B. Jeffrey, inventor of the clincher pneumatic tire, and his partner, R. Phillip Gormully, pledging themselves to the ideal of backing every G & J product with their personal guarantee. The film is brought rapidly to the present with a scene depicting two modern G & J dealers backing the company's reputation and quality products with their own personal pledge.

Next is the announcement that G & J, America's oldest tire manufacturer, has stepped out with a new full line well advanced in engineering developments and styling. Concluding, the film reminds the dealer of the assurance of permanence inherent in the G & J name, which has served motordom since 1891.

Titanium Pigment Corp., 111 Broadway, New York, N. Y., on June 6 held its annual stockholders' meeting at Sayreville, N. J., at which D. W. Robertson, J. L. Turner, and Harold Rowe were elected to the directorate to fill vacancies caused by the death of E. J. Cornish and the resignations of R. M. Roosevelt and W. F. Washburn. At the same time Charles Simon was elected a director to occupy a previously unfilled vacancy, to bring the board up to full membership. At the directors meeting which followed, Mr. Robertson, general sales engineer, was elected a vice president of the corporation. He has been with the company since 1926.

Vulcanized Rubber Co., Morrisville, Pa., finds business is worse than for the same period last year.

The General Electric Co., Schenectady, N. Y., on June 3, announced a decrease of 2% in its Cost of Living Adjustment Plan. The company has been paying 5% since August, 1937, and the new rate of 3% is effective as of May 28, 1938. Instituted in October, 1936, the plan provides for automatic changes in employe earnings, based on the progress of the Cost of Living Index as published by the United States Department of Labor. According to the terms of the plan, if the cost of living goes up, 1% is added to employes' earnings for each point of rise in the index up to 90. If the cost of living goes down, similar changes will be made downward, until the index reaches 80. The index figure of 83 announced by the United States Department of Labor on May 28 is 1.5 below the figure of 84.5 of the past three months.

National Industrial Conference Board, 247 Park Ave., New York, N. Y., on May 26, at the Waldorf-Astoria, held its twenty-second annual meeting at which officers and executive committee members were elected for the ensuing year. Among the successful candidates were: a vice chairman (reelected), Irenee du Pont, director, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.; executive committee members, David M. Goodrich, chairman, The B. F. Goodrich Co., 230 Park Ave., E. V. O'Daniel, vice president, American Cyanamid Co., 30 Rockefeller Plaza, A. W. Robertson, chairman, Westinghouse Electric & Mfg. Co., 150 Broadway, John A. Sweetser, president, Bigelow-Sanford Carpet Co., Inc., 136 Madison Ave., and Owen D. Young, chairman, General Electric Co., 570 Lexington Ave., all of New York.

Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y., has announced that reports from automobile tire dealers indicate the recent Tire Safety Week, sponsored by tire manufacturers, distributers, and dealers, succeeded notably in increasing sales of tires and in directing motorists' thoughts toward safety. President A. L. Viles stated that every one including press, radio, public and government officials, tire manufacturers, distributers, and dealers, manufacturers of allied products, and safety experts combined most generously to make the campaign a success.

Ludlum Steel Co., Watervliet, N. Y., and **Allegheny Steel Co.,** Breckenridge, Pa., specialists in the field of alloy steels, are cooperating with the New York Museum of Science and Industry, Rockefeller Center, New York, N. Y., in presenting a new exhibit, "Steels of Today and Tomorrow," which opened June 16, to continue as long as it serves its essential purpose. Featured are not only the myriad uses of stainless steel, but also new developments in tool, carbon, and alloy steels. Included are demonstrations of fabricating and welding methods. Examples of steel in almost every form are shown, as raw materials, tools, machines, and finished products. Also revealed is how stainless and alloy steels are utilized in the interests of safety, health, beauty, better building, swifter transportation, increased production, more useful products, and lower cost. Of special interest is a glimpse of new developments, some hardly beyond the laboratory stage, for example, Ludlum's method of coloring stainless steel—not merely applied coloring, but coloring which is in the steel itself and which has no adverse effect on stainless properties—color that ranges from a light yellow up to a very dark slate grey.

Johns-Manville Corp., 22 E. 40th St., New York, N. Y., according to President Lewis H. Brown, at the June meeting of the directorate established a policy, in recognition of the new era of broadened social responsibility upon which American industry is now entering, of widening the board's membership to include not merely stockholders' interests, but direct representation for the viewpoint of the general public. In consequence the board elected as a director Dr. Walter A. Jessup, president, Carnegie Foundation for the Advancement of Teaching.

Carrier Corp., Syracuse, N. Y., recently shipped to Ford Motor Co., Dearborn, Mich., what is reported to be the largest single centrifugal refrigeration machine ever built in this country. This machine, of 1,100 tons' capacity will be installed to cool rolls used in the mixing of rubber compounds. Driven by an 1,185 h.p. turbine and operating at 4,250 r.p.m., the refrigeration machine will cool 2,500 gallons of water per minute from 65.6° F. to 55° F. After complete testing in the Carrier plant, the centrifugal machine was shipped in four sections requiring two gondola cars.

The Greater New York Fund, 52 Broadway, New York, N. Y., recently announced the formation of two committees in the chemical industries to cooperate in the 1938 campaign. The committee canvassing employe groups has as its chairman Allen F. Kitchel, president, Binney & Smith Co., 41 E. 42nd St., New York. Langbourne M. Williams and J. Tyler Claibourne, Jr., president and vice president, respectively, of Freeport Sulphur Co., 122 E. 42nd St., are chairman and vice chairman of the committee to solicit gifts of firms in the industry.

Glyco Products Co., Inc., 148 Lafayette St., New York, N. Y., reported that late last month its vice president and general manager, Edward Rosendahl, embarked on a European business trip. He will visit the firm's representatives, Marcel Quarre & Cie., Paris, France, Rex Campbell & Co., Ltd., London, England, Industrie Grondstoffen Maatschappy N. V., Rotterdam, Holland, and E. Landerholm, Stockholm, Sweden, to obtain first-hand information on the European market.

Columbia Alkali Corp., Barberton, O., according to W. I. Galliher, director of sales, on June 1 opened a new district sales office at 3034 N. 16th St., Philadelphia, Pa., to cover eastern Pennsylvania, southern New Jersey, Delaware, Maryland, Virginia, and the District of Columbia. In charge of the office is the newly appointed district manager, Chris F. Bingham, for some time with Columbia Alkali's technical department.

The American Institute of Chemists, 233 Broadway, New York, N. Y., recently held its annual meeting in Atlantic City, N. J., at which Robert J. Moore, development manager, Varnish-Resin Division, Bakelite Corp., 247 Park Ave., New York, was elected president. Other officials also were named, including, as a councillor, Dr. Norman A. Shepard, director, technical service, American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York.

MIDWEST

THE Midwest, as far as business is concerned, fares no better than the rest of the nation.

The peak of production of 1938 automobile models is passed. One authority stated that unless conditions improve, the industry will once more hit the low of '32. Present production is down 45 to 55% compared with a year ago. Just when new models will be produced is uncertain; much depends on the course of general business, it is said. Sales of automobiles in April were about the same as in March, although a 30% gain is usual for the period. One report declared the industry needs a better outlet for new cars, and a workable plan is being carefully weighed to eliminate obsolete vehicles from the highways.

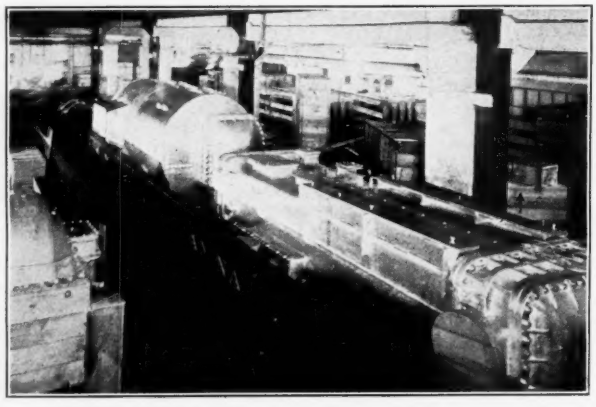
A later report for early June was more optimistic. Orders coming in were better than expected, and it is felt no complete shutdowns of any consequence will take place before mid-July.

Employment and payrolls in the Midwest also show a decline, contrary to the usual occurrence. The rubber manufacturing was among the industries showing a smaller contraction in wage payments than in employment. Thus a recent report reveals 34 rubber manufacturers with 12,745 employes earning $270,000, a drop from the previous month of 4.8% in wage earners and 2.6% in earnings. For all industrial groups in the district the decline for wage earners was 2.6% and for earnings 1.5%.

Baldwin Rubber Cleared

On March 25, 1938, Hon. Arthur J. Tuttle, one of the judges of the United States District Court of the Eastern District of Michigan, rendered an opinion in the case of Paine & Williams Co., Cleveland, O., versus the Baldwin Rubber Co., Pontiac, Mich. The former company had sued Baldwin for infringement of United States letters patent No. 1,715,523 to Turner for "Floor Covering" and United States letters patent No. 1,715,525 to Vrooman for

(*Continued on page 70*)



Giant Single Centrifugal Refrigerator Machine

OHIO

BUSINESS in Ohio is far from good, and the rubber industry too is experiencing the ill effects of this condition. It is reported that tire plants plan complete shutdowns for about a fortnight, supposedly for inventory taking, vacations, etc. But manufacturers are said to be disappointed in tire replacement sales; it is held unlikely that they will equal the 1937 figure, estimated at 29,800,000 units, although sales are now running close to last year's figure. Rising replacement sales in the last part of the year would be contrary to the usual trend. Manufacturers, however, are getting a better price for their tires than was the case a year ago.

Goodyear News

Returning to Akron early in June in excellent health and spirits after a European business trip, Paul W. Litchfield, president of the Goodyear Tire & Rubber Co., announced that while in Sweden he had completed plans for the erection of a new tire factory at Norrköping. He said the new tire factory would have a daily capacity of 600 tires and 600 tubes. The plant will cost $1,500,000, and construction is to begin at once. It is expected to be in production by the Spring of 1939 to serve the Scandinavian countries.

Visiting briefly in Germany, Mr. Litchfield conferred with representatives of the lighter-than-air industry. He expressed his regret and disappointment over the failure of the German industry to obtain helium from the American government for use in its new sky liner. He reported that the German airship company was considering revision of one ship with a view to using it with hydrogen for the South American trade.

The Goodyear president was impressed with business conditions in the places visited, particularly in the Scandinavian peninsula, where he stated the national budgets had been balanced and things generally were good, with business progressing smoothly and in orderly fashion.

While overseas Mr. Litchfield visited England, Germany, and the Scandinavian countries.

Fred Colley, head of Employes' Activities, has announced that the annual Goodyear Frolic will be held at Euclid Beach Park on August 8. All the best features of past picnics will be retained, and a good time is promised all.

Goodrich Activities

Work in the Akron plants of The B. F. Goodrich Co. was resumed Tuesday morning, May 31. A proposal presented by the Goodrich Local No. 5, United Rubber Workers of America, and approved by its membership was accepted by the Goodrich company. Under the terms agreed upon, employes will receive vacations with pay at one-half the 1937 rate; seniority rules are established; guarantees against work stoppages provided; and clearly defined formulas are found to govern procedures.

Recent Appointments

Ralph McPeake, well known in mechanical rubber goods sales circles for more than 25 years, has been named Detroit, Mich., district manager of the Goodrich mechanical goods division, announced W. S. Richardson, general sales manager. Joining the Diamond Rubber Co. in 1909 and Goodrich in 1914, Mr. McPeake has held various positions as a sales executive.

P. E. Tobin, who came to Goodrich in 1927 and was sales supervisor in the Cincinnati district from 1931, is now a member of the company's manufacturers' sales department with headquarters in Akron, according to G. E. Brunner, Goodrich sales official.

Thomas A. Aspell, for the past nine years general sales manager of the Goodrich original equipment tire division and a well-known personality in rubber and automotive circles, has been assigned to executive sales duties following an extended illness, according to President S. B. Robertson.

G. E. Brunner, formerly assistant manager of original equipment tire sales, has assumed the managership of the division, Mr. Robertson said. Mr. Brunner, in the rubber industry for the past 20 years, came to Goodrich in 1928 and has held various sales positions with the company since then. He will make his headquarters in Akron.

Personnel Mention

Dr. H. L. Trumbull, manager of Goodrich chemical research, has been named to the committee formed by the American Chemical Society to improve the professional standing of the chemist.

James D. Tew had continued as a director of the Goodrich company even after resigning the presidency last year, but when his term expired recently, he was succeeded by President Robertson.

Henry Little, manufacturers sales representative for Goodrich in Indianapolis, Ind., has resigned to accept a sales position with National Safety Marker Co., Pontiac, Mich. Mr. Little joined Goodrich as an office boy in 1900, was a salesman in New York state for five years, and then opened the company's first branch office in Indianapolis in 1909.

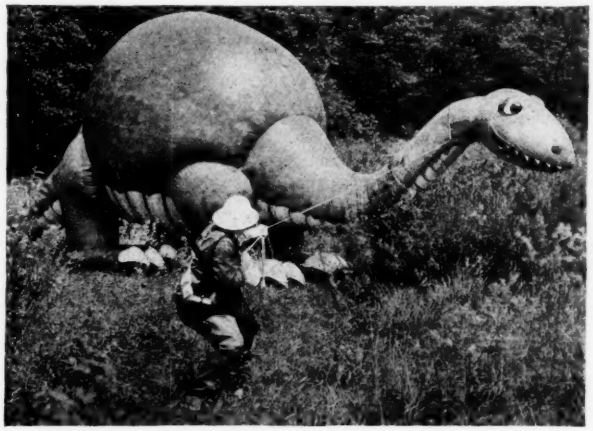
New Tire for Commercial Trailers

Operators of tractor-trailer units in many cases have been troubled by unusual conditions of tire wear on the trailers, according to Goodrich engineers. Most of this unusual wear, they determined, has been caused by the wiping action set up by the non-skid tread design on tires for free rolling wheels.

To overcome this condition Goodrich has just introduced a new Heavy-Duty Trailer type of pneumatic tire. Designed especially for use on free rolling wheels of trailers, although it performs equally well on the front wheels of trucks, the new tire, with four circumferential ribs, also has a modernistic sidewall design and all the features of the regular Goodrich line of commercial tires, including Plyflex for the distribution of stresses throughout the tire, Plylock, which protects against having short plies tear loose above the beads, and the new Hi-Flex cord, which retains its stretch and prevents dangerously hot internal tire temperatures.

Wind Tunnel for Airplane Tests

Science has created weather simulating extreme North Atlantic conditions in the world's largest refrigerated wind tunnel at the Goodrich plant in Akron to test a scale model of the 41-ton, 74-passenger, four-motored Boeing



Dinosaur Built by Goodyear for a Circus for Use in Street Parades; Inflated with 2,000 Cubic Feet of Air, the Figure Is 50 Feet Long, 12 Feet High, and Weighs 250 Pounds

transport plane, soon to be placed in service between New York and London. The tests were conducted by engineers of Pan-American Airways, for whom the plane was built, the Boeing aircraft company, and the Goodrich company. The air liner is equipped with de-icers and other modern aviation devices.

Special Rubber Hose to Feed Python

The feeding, a monthly event, of the giant python at the St. Louis zoo is quite an affair and further complicated by paralysis of the reptile's throat muscles. Consequently the force feeding method has to be resorted to. Feeding equipment consists of a five-foot length of special rubber hose fitted with a removal plunger. The hose, supplied by Goodrich, has a two-inch inside diameter and is of just the right stiffness for easy insertion down the snake's throat. To prevent possible injury or irritation of the throat membranes, hose is made with a smooth white rubber cover. Feeding the "Maharanee" is much like charging a muzzle-loading cannon. With the aid of about ten keepers the huge snake is stretched out on the floor, and the hose inserted down past the throat. Then ground rabbit meat is fed into the hose and by means of the plunger is forced into the snake's stomach. This operation is repeated until 21 pounds of meat have been consumed.

Firestone News

Firestone Tire & Rubber Co., Akron, in its series of 26 "Voice of the Farm" programs is featuring interviews with "Champion Farmers of America," including Albert Schroeder, pioneer user of rubber tractor tires.

At the Indianapolis Classic

When Floyd Roberts won the twenty-sixth Indianapolis 500-mile race, at 117.2 miles an hour, on Decoration Day, it marked the nineteenth consecutive year that the winner has ridden to victory on Firestone tires. All of the 33 cars in the race, however, were equipped with Firestone tires, and not a single tire failure of any kind occurred. This performance is even more noteworthy when one considers that lap speeds reached 124 miles an hour and track temperatures of 110 degrees were officially recorded.

Builds 1,304-Pound Tire

Recently completed by Firestone is a tire which regularly inflates to 45 pounds' air pressure, stands 79 inches high, weighs 1,304 pounds, and is built to carry a load of 25,000 pounds. The diameter of the rim on which it is mounted is 32 inches, and the rim width is 17 inches. It has a tread width of 20 inches. The tube alone weighs 102 pounds, and the protective flap weighs 36 pounds. One hundred miles of cord were used in building this tire, which is one of a set for use on a new earth moving unit manufactured by the R. G. LeTourneau Co., Peoria, Ill.

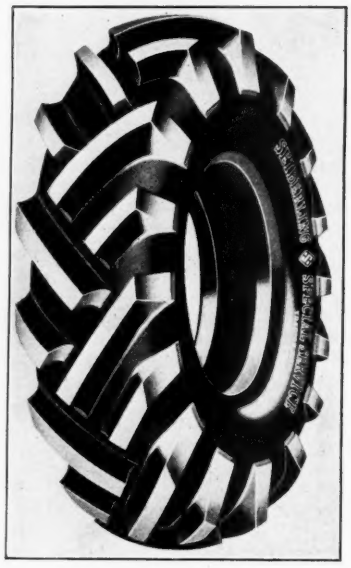
Seiberling Enters Tractor Tire Field

A tractor tire with a totally new tread design marked the recent entry of the Seiberling Rubber Co., Akron, into the farm tractor field, according to an announcement by Col. J. L. Cochrun, vice president in charge of sales. The new tire, developed after months of research, is said to embody the following advantages: self-cleaning tread, maximum traction, greater draw bar pull, welded carcass and tread, and durability. The new tire will be available in sizes: 9.00-36, 9.00-40, and 11.25-28, which are said to cover approximately 80% of the tractor tire market. With approximately 1,373,000 tractors in operation in the United States today, it is predicted that before many years have passed pneumatic tractor tire sales will exceed truck tire sales.

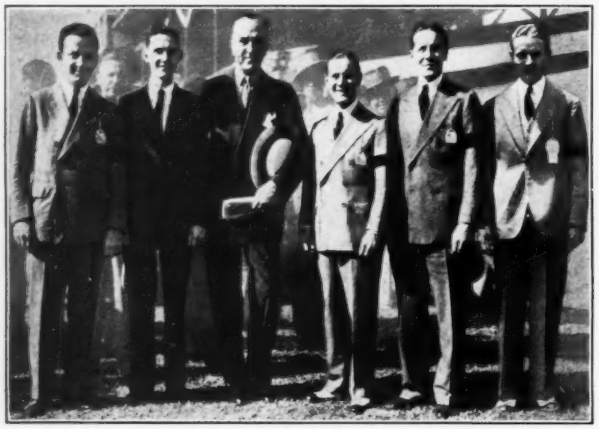
Film Aids Dealer Advertising

Assistance to independent tire dealers in figuring their advertising campaigns and in spending their advertising dollars in the most efficient way is offered by Seiberling with its dramatized sound slide-film, "Sometimes It Takes Dynamite." Each Seiberling branch is equipped with portable projectors and sound equipment so that the film can be presented at the dealer's place of business. Independent dealers who wish to see the film do not necessarily have to handle Seiberlings, but can make arrangements with the rubber company for a showing of the film.

According to J. H. Bunting, Seiberling director of advertising and merchandising, the new film was completed after several years of research into the advertising problems which confront independent tire dealers. Facts and figures are presented in the film which will be of great assistance to every dealer, he claims.



Seiberling Tractor Tire



Russell A. Firestone, Roger S. Firestone, Capt. E. V. Rickenbacker, Harvey S. Firestone, Jr., Official Referee, Leonard K. Firestone, and Raymond C. Firestone at the Memorial Day Classic

Foremen's Conference

Western Reserve Association of Foremen's Club, an association of industrial foremen's clubs from Ohio, Pennsylvania, and West Virginia, with headquarters at Goodyear Hall, Akron, on May 21 and 22 held a Western Reserve Association of Foremen Conference at Chippewa Lake Park, Medina, O. Despite the fact that the gathering was planned for only the one district of National Association of Foremen in Northeastern Ohio, delegates, totaling more than 500, representing the foremen from 55 different manufacturing plants, attended from Pennsylvania, Michigan, Indiana, New York, and Maryland.

Two sets of six conferences were scheduled. Among the talks of interest to the rubber industry were the following: opening address, "Industrial Security—How and When," by Wm. I. Engelhardt, advertising director, *Physical Culture Magazine;* "Men and Machines," illustrated with slide films, Chas. A. Mears, educational director, B. F. Goodrich Co., Akron; "The Diesel Engine," O. E. Treiber, chief Diesel engineer, Hercules Motors Corp., Canton, O.; "Seniority," W. H.

(*Continued on page 70*)

NEW ENGLAND

WORKERS in rubber manufacturing establishments in Rhode Island during May received total wages of $245,048, 6.3% less than in April and 12.5% less than in May, 1937, according to the Brown Bureau of Business Research.

A recent report from State Director of Labor Thomas F. McMahon, of Rhode Island, gave the number of employes in the eight rubber factories making returns in the state during May as 3,505, 6.9% less than in April and 14.3% less than in May, 1937.

Safety Belt for Motorists

The Rusco safety belt, similar to belts used by airplane passengers, recently was introduced for automobile passengers. The use of this belt, which fastens to the sides of the seat, is claimed to reduce effectively the seriousness of auto accidents by holding passengers in their seats during a collision. It is particularly useful where children are riding alone on a seat.

Everett G. Holt, acting chief of the Leather-Rubber Division of the United States Bureau of Foreign and Domestic Commerce, Washington, D. C., was the principal speaker at a luncheon meeting at Narragansett Hotel, Providence, R. I., on May 25, under the auspices of the foreign trade committee of the Providence Chamber of Commerce. Mr. Holt discussed the importance and possibilities of foreign trade in New England. The meeting was held as a part of a national observance of Foreign Trade Week. Mayor James E. Dunne delivered the address of welcome.

Standard Machinery Co., Mystic, Conn., and **F. J. Stokes Machine Co.,** Philadelphia, Pa., have completed arrangements whereby the latter becomes sole sales agent for the complete line of Standard plastic molding presses, which are used in the molding of thermosetting plastics, mechanical rubber goods and in other fields. Hydraulic pressure is exerted through toggles by a duplex pumping system, operating at low pressures.

Robert C. Moeller, treasurer and general manager of the Collyer Insulated Wire Co., Pawtucket, R. I., recently purchased a country estate in Cumberland, R. I., including 42 acres and a 22-room house.

James H. Holland, who recently resigned as head of the traffic and order department of the American Wringer Co., Woonsocket, R. I., after 25 years' service, has been appointed High Sheriff of Rhode Island.

Farrel-Birmingham Honors Old Employes

On May 23, Farrel-Birmingham Co., Inc., nationally known machinery manufacturer, held its second annual service banquet at Ansonia, Conn. Guests of honor were 130 men who have been with the company for a quarter-century or more. Nine of these, who have served Farrel-Birmingham for 50 years or over, were seated at the head table. To 12 men who this year joined the ranks of the 148 with over 25 years' service, service pins were presented. John D. Martin, who has just completed 50 years' service, received a gold watch and chain.

President Nelson W. Pickering was toastmaster, and Franklin Farrel, Jr., chairman of the board, presented the awards to the veteran employes. Entertainment was provided during the evening.

The chief speaker of the evening was Louis M. Ruthenburg, president of Servel, Inc., who paid eloquent tribute to the loyalty of Farrel-Birmingham's veteran employes and urged them to view industrial relations through the eyes of "logical liberalism." Mr. Ruthenburg in his address divided the American people into four classifications—die-hard tories, emotional liberals, logical liberals, and extreme radicals or "moochers." The emotional liberals, he said, advocated liberal measures without considering whether such measures were practical or harmful, while the "moochers" comprised the great host whose allegiance could be bought by jobs, political preferment, or government subsidy. On logical liberalism, stated Mr. Ruthenburg, rests the hopes of the nation for a continuation of the American system which has given our workingmen the highest standard of living in the world. He urged his hearers to adopt the spirit of constructive cooperation and fair play for all groups of the population, whether workers, employers, or security holders, and called upon them not only to support constructive and generally beneficial social and economic measures, but to see that such were attained by sound methods in conformity with the old American traditions.

William O'Neil, president of the General Tire & Rubber Co., Akron, O., on June 8 received the honorary degree of doctor of laws from Holy Cross College, Worcester, Mass., from which he was graduated in 1907. Among the 1938 graduates was Mr. O'Neil's son, John. Two other sons preceded him; a fourth is an undergraduate; and a fifth son expects to matriculate there eventually. William O'Neil's three brothers also are Holy Cross alumni. The General Tire chief executive was awarded the honorary degree for distinguished accomplishment in the field of industry as he has been active head of one of the five leading tire and rubber companies in the country for the past 16 years, a record not reached by any other living president of a large rubber manufacturing concern.

Fisk's Tire Safety Rules

Scientists of the Fisk Tire Co., Chicopee Falls, Mass., recently offered five rules for protection of motorists during summer months—hardest period of the year on tires.

1. Check tires for tread conditions, surface cuts, and carcass conditions. Inside walls should be examined carefully for weaknesses and breaks.
2. Check all valves, not forgetting the spare.
3. Check air pressure regularly once a week.
4. Favor right rear tire, remembering it is subject to hardest wear.
5. Don't bump curbs; start and stop slowly; and drive at a reasonable speed. Hot highways and high speeds generate internal heat well over 200 degrees, increasing blow-out danger and also tread wear.

A complete examination at the start of the season and observance of the rules will add greatly to the pleasure of summer motoring by insuring nonskidding qualities and minimizing both the blow-out hazard and the inconvenience of flats, they said.

Tread Prediction

With improvement of road surfacing throughout the United States, all automobile tires of the future will use the circumferential rib tread exclusively, C. E. Steele, of the Fisk commercial tire sales department, predicted last month. The block and angular tread designs, developed for the dirt road era when they were needed for gripping, are steadily being eliminated in favor of the rib type. With standard hard road surfacing, the circumferential ribs tend to squeeze together under the weight of the car. This condition provides the further advantage of reducing sideslips. This future tire, he added, will be quieter, steer easier, and produce less heat.

Tire Traction Increases with Wear

The Fisk Tire Co. claims to have perfected a tire tread with non-skid qualities which—instead of diminishing—actually increase with wear. C. E. Maynard, factory manager, reports that tests showed the company's new safety tire had 17% greater traction efficiency after running 18,000 miles than it did when new. His explanation was in the unique construction of the seven circumferential ribs with their cross-wise inserts of soft rubber. The hundreds

of gripping units become increasingly flexible with wear; the more pliable they are, the tighter they hug the road. At the same time other tests showed, Mr. Maynard said, that the tire when new will stop an automobile from one to two car lengths shorter than conventional tires tested and will reduce side-skid from one to two feet.

Tires Add to Car Comfort

With comfort one of the motorist's primary considerations today, Fisk points out that nearly one-fourth of a car's riding ease is directly dependent upon tires. Both tires and shock absorbers are rated equally as contributing 21% to a car's riding qualities by the Society of Automotive Engineers. Tires are more important than soft seat cushions, which contribute 19%. To secure maximum comfort from tires the following things should be avoided, Fisk scientists advise: rigid or relatively unyielding carcass body, sidewalls, and tread. A flexible tire gives greater comfort by absorbing road shocks, and also longer wear through heat reduction.

Correct Tire Pressure Important

Importance of air pressure and the dangers of underinflation have increased greatly since introduction of the low-pressure tire, according to Fisk. A tire that formerly required 40 pounds of air and was operated with 36 was underinflated only 10%. Today if the modern tire with a recommended pressure of 28 pounds is run with 24, it is 15% underinflated. This statement means the modern tire will suffer 50% more damage, although both tires lack the same four pounds of air. Underinflation results in quick tread wear, difficult steering, uneven braking power, and loss of stability, Fisk scientists warned.

Botsel's Garage, Newport, R. I., was awarded by the local board of alderman a contract for hose for the Newport Fire Department at $1,000 for 1,000 feet. Mr. Botsel stated to the board that the type of hose he was offering was being discontinued by the manufacturer, and the city was able to get it at cost, whereas formerly the city had paid $1.20 per foot for it. He pointed out that hose of the same brand purchased by Newport 25 years ago was still in use.

James H. Stedman has announced the recent sale of his rubber flooring business, Stedman Reenforced Rubber Flooring, 1105 Beaver Hall Hill, Montreal, P. Q., Canada, to Armstrong Cork & Insulation Co., Ltd., of Canada. Mr. Stedman has returned to Braintree, Mass., where he will devote his time to the development of his Braintree property. J. N. Anderson, associated with Mr. Stedman in Canada for the last three years, remains there as a member of the Armstrong staff. Two years ago Armstrong Cork Co., Lancaster, Pa., acquired the Stedman Rubber Flooring Co., South Braintree, Mass.

Shepards

E. L. Hanna

Chief Chemist

Ezra Lloyd Hanna has been with the Davol Rubber Co., Providence, R. I., since February 1, 1917, except for a brief period from September, 1918, to February, 1919, when he was a private in the gas division of the Chemical Warfare Service. He joined Davol as a chemist and later was made chief chemist. His only other business connection was employment with the Star Rubber Co., Akron, O., following his graduation (B.S.) in 1915 from the Municipal University of Akron.

Mr. Hanna was born in the Rubber City on June 29, 1893. He was educated at the local elementary and high schools, Buchtel College, and Akron U., where he was president of the first graduating class.

He belongs to Zeta Alpha Epsilon, Masons, Past Monarch-Grotto, American Chemical Society, Annaquatucet Golf Club, and Rhode Island Rubber Club. With the last named he was on the executive committee from 1935 to 1937 and now again for the 1938-1939 term and is immediate past president of the club.

Mr. Hanna has taken out several patents relative to rubber processes. He is also interested in golf, gardening, hunting, and fishing.

Married, he has two boys, one 17 and the other 14, and a girl 12. Their home is in North Scituate, R. I.

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pH Test Paper

Used like litmus paper, Hydrion wide-range test paper rapidly determines the approximate pH of liquids, showing the following color changes:

pH		Color
2	Very Strongly Acid	Red
4	Strongly Acid	Orange
6	Weakly Acid	Yellow
8	Weakly Alkaline	Green
10	Strongly Alkaline	Blue

By observing the color of the outer diffusion zone on spot tests, this paper can be used with turbid or colored solutions.

NEW JERSEY

NEW JERSEY rubber manufacturers find little change in conditions during early summer, with many plants reporting a still further drop in business. Hard rubber production has declined considerably, while heel and sole output finds no change.

Acme Rubber Mfg. Co., Trenton, announces that business conditions are normal at this time.

Pierce-Roberts Rubber Co., Trenton, because business has dropped off recently, has dropped an extra shift.

Mercer Rubber Co., Hamilton Square, finds business picked up considerably the past month, with many new orders reported. Officials are optimistic over the future.

A. Boyd Cornell, secretary-treasurer of the Hamilton Rubber Mfg. Co., Trenton, and his wife spent some time at White Sulphur Springs, W. Va.

Luzerne Rubber Co., Trenton, stated hard rubber production has declined further.

Lawrence M. Oakley, of the Essex Rubber Co., Trenton, who has been on a business trip through New England, is of the opinion that conditions are beginning to improve slowly.

Lambertville Rubber Co., Lambertville, N. J. Charles H. Weelans, bankruptcy referee at Trenton, has approved an order fixing the amount of claims of the Millfactors Co., of New York, against Lambertville company at $40,000. It is said that the latter concern at various times borrowed more than that sum from the New York firm.

Near-Para Rubber Co., Trenton, finds business has improved, with a better demand for reclaimed rubber.

Pocono Co., Trenton. Judge Philip Forman in the United States District Court has appointed Benjamin Haber and J. A. McQuillen permanent trustees of the Pocono Co. Both had been serving in a temporary capacity. The plant has been making considerable progress under a reorganization set up, and losses have dwindled to $2,600 during a month, according to Herbert W. Backes, counsel for the trustees. Counsel declared he expected the company to show a profit from now on.

American Hard Rubber Co., Butler N. J., has announced the appointment as works manager, to succeed the late Harry Weida, of Stanley P. Fisher, formerly assistant works manager. Mr. Fisher joined the company in 1921 as industrial engineer of the College Point, L. I., plant, but since 1926 has been on the works management staff at the New York, N. Y., office, 11 Mercer St.

Rubber Industry in Europe

GREAT BRITAIN

R. G. A. Meeting

The annual general meeting of the Rubber Growers' Association was held on May 2 in London, when J. L. Milne, last year's vice chairman, was elected chairman for the ensuing year. Mr. Milne has served on many committees of the association; he has a keen grasp of business affairs in the City of London and a wide knowledge of trade conditions in the East.

At the same time, F. E. Maguire was elected vice chairman. He is chairman of important and successful rubber plantation companies and vice chairman of the newly formed British Rubber Publicity Association.

The retiring chairman, A. P. Hadow, reviewed various matters of importance to producers and consumers. Discussing the regulation of rubber and the recommendation of the International Rubber Regulation Committee to permit new planting during 1939 and 1940, he said producers would have to take stock of their position and endeavor to visualize the position of the industry in the future, assuming that such new plantings had reached maturity.

"They will have to determine," he declared, "whether the average return received up to the present from the investment of a very large amount of capital justifies their sinking more capital in that enterprise. . . . All partners in the industry have suffered in the past from the wide fluctuations to which the price of rubber has been subjected to over a long period of years."

It was indisputable that an adequate return had not yet been received on total capital employed, he continued and pointed out that it has been overlooked that dividends paid in particular years were paid on the par issued capital; while proper account was not taken of the fact that large areas had been developed out of premiums on shares and profits set aside in good years.

"It is necessary," he said, "to remove this misapprehension in regard to dividends in order to establish what may be accepted by consumers, governments, and producers as a reasonable margin of profit, after meeting the many charges which the industry has to bear."

New Organizations

Under the terms of the International Rubber Regulation Agreement the establishment of separate organizations for conducting research and propaganda and for coordinating these activities on an international basis was provided for. Accordingly the following organizations have now been formed: British Rubber Producers' Association, London, and British Rubber Publicity Association, London, which have taken over the Research and Propaganda formerly carried out under the auspices of the Rubber Growers' Association; Rubber Stichting, Amsterdam, Holland, operating a research department at Delft and a Technico-Commercial Department at Amsterdam; and Institut Français du Caoutchouc, Paris, France.

The coordinating bodies are the International Research Board and the International Rubber Propaganda Committee. They are drawn from the national organizations, the constitution of the first being as follows: British Delegation, H. Eric Miller, chairman, G. C. Denham, Sir Frank Stockdale; Dutch Delegation, W. J. de Jonge, vice chairman, Drs. L. P. le Cosquino de Bussy and G. van Iterson, Jr.; French Delegation, Louis Blaringhem and Philippe Langlois.

The Propaganda Committee is constituted as follows: chairman, appointed by the International Rubber Research Board, Mr. Miller; British Delegation, James Fairbairn and F. E. Maguire; Dutch Delegation, Mr. de Jonge, vice chairman, and Dr. P. J. H. van Ginneken, with Dr. van Iterson, as alternate; French Delegation, M. P. Petithuguenin, with alternate.

G. E. Coombs has been appointed secretary to both international organizations.

Notes

David Moseley & Sons, Ltd., now makes buckets of Neoprene, claimed to be strongly constructed and able to withstand rough handling and at the same time to be light and flexible; they are guaranteed to resist animal and mineral grease as well as a wide range of corrosive chemicals. While they are primarily intended for use in tanneries, they can be used in other industries where corrosive chemicals are handled.

Irish Dunlop Co. showed net profits of £74,211 for 1937 against £55,803 the year before.

Binney & Smith & Ashby, Ltd., London, has been appointed sales representative in Great Britain and Ireland for Utility Mfg. Co., Cudahy, Wis., U.S.A., manufacturer of rubber machinery.

Imperial Chemical Industries, Ltd., London, and the I. G. Farbenindustrie, A.G., Frankfurt a.M., Germany, are reported to have formed jointly a concern to be known as the Trafford Chemical Co. The new concern has a nominal capital of £500,000.

The London "Safety First" Council in cooperation with 11 tire manufacturers on June 8 demonstrated in Shoreditch the importance of having in good condition tires on motor vehicles. New tires and smooth ones were used on a slippery surface, as three automobiles, each equipped in the first case with new tires and later with well-worn casings, were driven at identical speeds toward a level-crossing. The car driver applied his brakes at exactly the same spot in each test and showed how the new tires enabled him to pull up with relative ease; while the smooth tires skidded and landed him in difficulties. The road surface was kept wet for all the runs, and in each instance the brakes were applied suddenly, as would be necessary in an emergency.

The Rubber Age, 88-90 Chancery Lane, London, W.C.2., has announced that on May 20 Publisher Herbert Standring reliquished his position. His successor is Editor G. S. Ranshaw, who will fill both positions. P. Blundell Boycott, formerly deputy advertising and circulation manager, now takes full charge of both these departments. The progressive note emphasized in recent issues will be continued.

U. S. S. R.

At the Uralian heavy machine factory the first hydraulic vulcanizing press for belting has just been constructed. The platen measurement[1] is 1,500 by 1,500 mm.; tonnage of the press, 3,260 tons; specific pressure, 29 kg/cm.; and stretch of belting, 12%. The press, made entirely of Soviet materials, is supplied with various accessory devices, as a special regulator of hydraulic pressure to maintain uniform pressure per unit of area at all times. There is also a take-off and rolling up device and a hydraulic jack to raise heavy rolls of finished belting. Preliminary tests with the press have proved satisfactory.

[1] *Caoutchouc i Resina*, Jan., 1938.

FRANCE

Imports of crude and manufactured rubber into France in 1937 increased in many lines, compared with 1936. Crude rubber came to 672,691 against 636,053 quintals; waste, 41,485 against 30,002 quintals; and reclaim 2,801 against 295 quintals. Pneumatic tires and tubes rose from 36,942 to 40,511 quintals, because of higher imports from Belgium, which supplied about three-quarters of the whole, and United States and Canada. Shipments from Germany and Great Britain fell sharply. Rubber footwear increased considerably from a total of 468,991 pairs to 1,129,678 pairs; other rubber soft goods were 7,102 against 5,164 quintals; hard rubber goods rose from 697 to 975 quintals. The most important decline was noted in imports of uncovered rubber thread, 6,562 against 7,945 quintals, a decline largely due to the drop in imports from the United States. While in 1936 this country had ranked first as supplier of uncovered thread, with Great Britain a close second, in 1937 the positions were reversed, although Great Britain's shipments also fell off somewhat. Japan, however, increased her share slightly.

RUMANIA

Effective March 12, 1938, imports of various materials and commodities into Rumania were made subject to import permit requirements and to import permit taxes. Among these was crude rubber, which is now subject to an import permit tax of 10 lei per 100 kilos.

SWEDEN

The Swedish tax of 3.50 crowns per kilo on imported and domestically produced rubber casings and solid tires for automobiles, trucks, tractors and motorcycles was canceled by a decree of April 30, 1938. This decree became effective May 9, 1938, and refund of tax already paid on existing stocks is provided for. It appears that this measure is intended to extend the use of tires and to promote public safety.

ITALY

The Pirelli concern of Milan, Italy, it is reported, will replace cotton entirely by high-grade artificial fiber in the manufacture of tires. This fiber is to be produced by the firm itself to insure that it answers the most stringent requirements. It seems that the firm has for some years past been acquiring idle rayon factories which it has equipped with up-to-date machinery. There the special fiber is to be manufactured in collaboration with the S. A. Cartiera di Tolmezzo.

GERMANY

Imports and Exports

After the unusually high figures reached at the end of 1937, Germany's crude rubber imports fell considerably in the first two months of 1938 and were appreciably under the amounts for the corresponding months of 1937. But in March a spurt occurred again, when the record quantity of 109,494 quintals was imported, against 78,421 quintals in March, 1937. This record brings the amount for the first quarter of 1938 to 244,617 quintals against 230,443 quintals in the first quarter last year.

Figures for imports of manufactured rubber goods declined sharply in quantity, but actually a small increase in amount occurred in the first quarter of 1938 as compared with the corresponding quarter of 1937 because in the latter period large amounts of old tires were included. The comparative amounts were 4,695 quintals, value 1,289,000 marks, against 25,047 quintals, value 1,063,000 marks.

Exports declined in quantity from 44,885 quintals in the first quarter of 1937 to 41,588 quintals in the 1938 period; while the value rose slightly from 10,597,000 to 10,887,000 marks.

Dechema Meeting

Corrosion caused by gases in chemical technique and its prevention were discussed at the joint meeting of the Dechema, German Chemical Plant Association, and the Society for Corrosion Research and Protection of Materials, held June 9, in Bayreuth, in connection with the meeting of German chemists.

Company News

The Semperit-Oesterreichisch-Amerikanische Gummiwerke A.G., Vienna, reports that despite decreased sales and increased prices of crude rubber and other costs, profits during 1937 permitted the payment of a dividend for the first time in six years. Net profits for the year were 997,810 schilling, which with the carry-forward from the previous year of 652,933 made available a total of 1,650,743 schilling. The dividend represented 5%.

Gummi-Werke Elbe A.G., Piesteritz bei Klein-Wittenberg, had a profitable year. The company, which produces chiefly technical goods besides heels, soles, footwear, thread, hard rubber combs, etc., reported increased business in 1937 both at home and abroad. Net profits were 116,417 marks, and an 8% dividend was paid.

C. Muller, Gummiwarenfabrik A.G., Berlin-Weissensee, announced that 1937 sales were the highest, both in quantity and value, that the company had ever attained since its formation. Exports showed a 20% increase as compared with the preceding year, and net profits, including the carry-forward from 1936, came to 85,653 marks. A 6% dividend was declared.

BELGIUM

Englebert & Co., Liege, Belgium, reported for 1937 gross profits of 20,500,000 francs against 18,200,000 francs in 1936. After writing off various items, deducting expenses and a loss of about 4,500,000 resulting from the devaluation of the French franc, net profits of 2,690,000 francs remain. The report states that the position of the various foreign branches remains unchanged, except the Holland branch which is suffering as a result of the uncertainty in the local tire market.

HOLLAND

The prevalence of hoof and mouth disease in Holland is arousing interest there too in the rubber galoshes for cattle recently introduced in England. The Rubber Stichting[1] has sent several of these shoes to the director of the States Veterinary Research Institute at Rotterdam to determine their value in treating hoof disease.

H. Rijkenberg,[1] of Purmerend, to increase the usefulness of the traditional wooden shoe, suggests providing it with a rubber upper nailed to the top of the shoe. It is intended for farmers to protect them when walking through wet grass, but it is also serviceable for workers in artificial silk factories and the like, where the shoes and trousers of the men frequently come in contact with lye. The efficiency of the shoe, it is suggested, could be still further increased by attaching a rubber sole.

Incidentally it has already become the custom to supply wooden sabots with rubber soles, to the chagrin of the makers of these shoes who complain that the rubber sole prolongs the life of the wooden shoe to such an extent as to cause a considerable curtailment in the demand for new shoes.

[1] *Rubber*, Mar., 1938.

Racing Tire Pressure

In developing Captain Eyston's Thunderbolt,[1] racing car which established new world's speed records last summer, three methods were attempted to achieve higher speeds: reduction of car weight, increasing the tire inflation pressure, and further streamlining.

The Dunlop Rubber Co., Ltd., which furnished the tires had originally insisted on an inflation pressure not exceeding 90 pounds per square inch, because the 120-pound pressure carried in the tires of Sir Malcolm Campbell's Blue Bird had given trouble. The Dunlop company finally consented to an inflation pressure of 100 pounds, but it would go no further as this pressure also involved risks.

As the car weight could not be reduced, a further increase in speed was obtained by improved streamlining.

[1] *Automotive Ind.*, Apr. 2, 1938, p. 480.

Rubber Industry in Far East

NETHERLAND INDIA

Gutta Percha

Since the extended use of wireless telegraphy the importance of gutta percha declined considerably, but attempts in recent years to combine it with rubber, once more center attention on it. Formerly gutta percha was a jungle product brought in from the forests by natives who obtained it by the drastic method of felling entire trees, ringing them, collecting the material after it had gathered and hardened in the cuts, and then kneading it, after softening it again in warm water, into pear- and sausage-shaped lumps of various sizes. This ruthless system has given way to plantations where the trees are regularly tapped and where a large proportion of the gutta is obtained from the leaves that are periodically collected.

According to an article by G. L. Tichelman in the *Alg. Landbouw Weekblad,* there are now three regular gutta percha plantations in operation. First is the government estate established 50 years ago at Tjipetir, Java, where an area of 1,300 hectares is under gutta percha. The output is estimated at around 200,000 kilos annually. At one time there was such a demand for pure plantation gutta that Tjipetir could not meet it.

Next is the Selborn estate at Kuala Lipis, Malaya, on the border of Siam. It was opened up 35 years ago by the "Maintenance," said to be the largest cable manufacturing concern in the world; here 1,000 hectares were planted with seed from Tjipetir, and output is also about 200,000 kilos a year.

Finally, A. E. Bruinier in 1922 established a plantation in the Asahan division of East Coast Sumatra at Batu Tunggal, starting with 23 hectares, which he gradually extended to 165 hectares.

The cultivation of gutta percha is not an easy matter, and other attempts to establish it in Langsa, Atjeh, and in Majang, East Coast Sumatra, on a larger scale, failed.

Methods of Collection

The gutta percha is obtained from the trees by tapping as well as by mechanical or chemical extraction from the leaves. Tapping is commenced on eight-year-old trees if of sufficient girth; for leaf gutta, the trees are pruned when they are five years old; a hectare yields about 6,600 kilos of leaf from which about 200 kilos of gutta are extracted. Purified plantation gutta appears on the market in the form of hard, inelastic blocks, sometimes, when very pure, of a whitish color, but usually tinted gray or reddish because of the presence of oxidized tannic acid combinations. Leaf gutta is supplied in the form of blocks and also crumb.

At Tjipetir there are huge mills for working the leaf as well as suitable equipment for chemical extraction.

Mixing Gutta with Rubber

Attempts have been made in recent years to increase the use of gutta, and it seems that a new field has been opened by mixing it with rubber. Crumb gutta is used and is added to latex and mechanically treated with heat until thoroughly combined. The elasticity of this product can be more or less regulated by varying the proportion of gutta. Gutta percha dissolves readily in benzene and benzol.

The advantage of combining it with rubber is said to be that it improves the aging qualities and tensile of rubber, increases its resistance to acids, oils, fats, and salts, and raises its insulating power.

Exposed to air and light, gutta percha may deteriorate in three months, but when properly protected, it will remain in good condition for years.

Braak to Visit America

In connection with the above, it is of interest to know that Dr. H. R. Braak, technological advisor at the Government Agricultural Enterprises is shortly leaving for America chiefly in order to examine the possibilities of extending the American market for gutta percha, as well as for other Netherland India products.

SARAWAK

Rubber Industry Data

Comparatively little is known about rubber growing in Sarawak, that remote territory that stretches along the greater part of the northwest coast of Borneo and is ruled by the white Rajah Brooke. The information contained in two separate articles appearing in recent issues of the *Straits Times* therefore is particularly welcome.

In the recommendations for the renewed period of restriction made by the International Rubber Regulation Committee, the basic quota for Sarawak for 1939 is 43,000 tons; it was 32,000 tons in 1938. The total area planted to rubber is put at 215,800 acres.

Method of Restriction

Until the end of January, 1938, output was restricted by the enforcement of a tapping holiday of one month after every three months of tapping. This system did not prove to be either equitable or effective; the greatest difficulty was offered by the vagaries of weather; thus rain might prevent tapping during a great part of the tapping months, while, during the holiday month, dry weather might prevail. Consequently a restriction system similar to that in force in Malaya was introduced. Assessment is still not completed, for lack of transportation facilities and the irregular method of native planting delay the work.

Asiatic Holdings

A large part, if not the greater part, of the rubber appears to be produced by Chinese and Malays, whose methods resemble those of the natives in Dutch territories. Trees are very closely planted; numerous gardens have as many as 400 trees per acre; over-tapping is rife, and on 95% of the gardens tapping is bad; while the product, for the most part partially air-dried sheet, is inferior.

Because of the careless method of preparation, the price obtained is 2 to 3 cents a catty (catty equals about 1⅓ pounds) under the Singapore market price, and as the government also levies a cess which at present is 3 cents (local currency) a catty, it is clear that the native does not get much for his rubber, especially when prices are low.

There are, however, Asiatic owned areas, especially those under Chinese control, where methods are good, tapping is excellent, and trees have been properly spaced.

Soil and Yields

The soil on the whole appears to be very fertile so that despite the dense planting and lack of proper cultivation, there are many fine trees on Asiatic holdings. Owing partly to this good soil and partly also to over-tapping,

high, and sometimes unbelievable yields are obtained. To quote from one article:[1]

"It has been proved, though it sounds fantastic, that some Dayak holdings of ten-to-twelve-year-old trees have yielded as much as 1,600 pounds an acre, with a stand of some 300 trees an acre. Unfortunately for the owners, the bark reserve on these trees is practically nil; moreover, the knife-work has been very severe, though as a rule, the plan is only a single cut on one third circumference or a daily half circumference Basal V."

Fine rubber ruined by excessive and careless tapping is unfortunately a common story here. But it is hoped that the new system of restriction with closer supervision of tapping methods will halt this ruthless exploitation and save at least the young rubber.

On European estates the average output is said to be about 500 pounds an acre, although 700 pounds have been obtained on A.B.C. tapping. The yield on some exceptionally fine Chinese holdings, where tapping was up to European standards, was still better, working out at over 800 pounds an acre for 11-year-old trees.

No Budding

There appear to be no bud-grafted areas in Sarawak, says the same writer, but one or two European controlled estates have a few acres planted with clonal seed.

Rubber here is comparatively free from serious disease, but owing to close planting and excessive tapping moldy rot is prevalent in many areas.

[1] Apr. 14, 1938.

Cosmetics for Workers

A new protective treatment for industrial workers' hands is now being marketed. It consists in the use of two different creams, one for protecting the hands during work and the other for use after work.

The No. 1 cream is rubbed into the hands, and on the arms, if necessary, before starting work. It forms an invisible, non-sticky, unnoticeable film which protects the skin from the action of chemicals, solvents, grease, oil, gasoline, and other harmful substances. When the hands are washed, the film comes off easily, bringing with it all the dirt, grease, paint, lacquer, etc., that the hands have picked up and leaving them smooth and clean without the use of abrasives.

The No. 2 cream is applied after finishing work. It replaces the natural oils of the skin with a soothing cream which keeps the hands soft and free from chapping and cracking. This cream is also used by those whose hands are constantly wet with water, since the No. 1 cream is not suited to provide protection against the effects of water and aqueous solutions.

MALAYA

Against Higher Dutch Quota

In a recent article,[1] "Is the Increased Dutch Quota Warranted?" R. H. Wright concludes with the emphatic statement that the increase of 91,500 tons is *not* warranted. He claims to be voicing the opinion of many, if not the majority of boards of directors and shareholders in London when he protests this increase in behalf of the Malayan producer.

Examining the case against Netherland India, Mr. Wright first takes up Netherland India estate rubber and shows that in 1937, when permissible exports for the entire year worked out at 83.75% of basic quota, Dutch estates just about made their quota; at the same time he calls attention to the fact that during the last half of that year, the period of highest tree yield and when permissible was 90%, they failed, except in the last month, to obtain their awarded crops.

The Dutch, failing to produce the necessary evidence for an increase of basic quota from the estates, encouraged the natives to over-produce, Mr. Wright declares, adducing in proof the fact that coupons for the last quarter of 1937 and even as far ahead as January and February of the current year were distributed to natives in July-September on a 90% basis of permissible exports. This policy was followed, he claims, so that natives could build up a surplus during the second half of the year, "with the object of proving that the native producer was under-assessed and a revision of quota called for."

Though natives over-produced 22,645 tons in the second and third quarters of 1937, crops fell drastically in the final quarter, and the "much-desired" surplus did not materialize.

Explaining such wide fluctuations, Mr. Wright continues, "When granted inducements to increase production, such as the advance issue of coupons, the planter knows that the native welcomes the opportunity to earn a few more guilders, and that in doing so the tapping methods used do not always enhance the life of the trees although for a time they will respond more liberally to such drastic treatment than tapping. . . . With thousands of smallholders adopting such methods the production of native rubber should rise on occasion by thousands of tons—to drop as suddenly coincident with the refusal of the ill-treated trees to aid their owners.

"There are about 800,000 native producers in the Dutch East Indies; if in any one month each smallholder should increase his output by only 10 lbs., the total increase for that month would amount to a shade over 3,571 tons. For the quarter, the figure would be over 10,700 tons. It would appear that a strong case exists for a closer inspection of Dutch native tapping methods."

Mr. Wright attempts to clinch his argument, that the increase of 91,500 tons is not warranted, by citing the results of the Dutch tree census. From this it can be gathered that the average stand per acre is about 281 trees; Mr. Wright is puzzled how such closely planted stuff could ever hope to qualify for an award even approaching that of standard and goes on to quote the classification of the native areas in the census which indicated 78% consisted of mediocre, poor, and neglected gardens.

[1] *The Planter*, Apr., 1938.

Adverse Conditions

The drop in the price of rubber and the cut in the quotas are having an adverse effect all around, and it is felt that improvement will take time. This belief has led producers to propose a reduction in wages to Indian labor, and it is expected that in view of present conditions the Indian government will offer no objections.

Government revenue from rubber exports during the first two months of 1938 fell by over $500,000 (Straits currency) to little more than one-third of the estimated amount.

A few failures occurred among rubber dealers including that of the Japanese firm of Kohyei & Co. The liabilities are said to be almost $1,000,000 (Straits currency); while the assets include office furniture, goods at a godown, and a number of unfilled contracts. It is said that the magnitude of the failure caused some consternation in the rubber market in London.

Incidentally, exports of rubber to Japan dropped sharply in April, from the high of 5,346 tons in March, to 1,916 tons in April, the lowest figure for the past six months.

Malayan Production

Malayan rubber production during the first quarter of 1938 was 108,455 tons, against exportable 105,350 tons. Of this, estates over 100 acres produced 70,441 tons, and small estates, 38,014 tons. The amount exported came to 105,545 tons, or 195 tons above exportable. However, as the country was under-exported by 2,820 tons at December 31, 1937, exports are still 2,625 tons short of the permissible quantity.

A RECENT REPORT FROM THE WAR FRONT in China states that when Japanese soldiers are severely weakened by continuous fighting, lack of sleep, or exhausting heat, they inhale oxygen provided in small tubes and released into a rubber-silk bag.

Editor's Book Table

NEW PUBLICATIONS

"Baldwin-Southwark." Baldwin-Southwark Corp., Philadelphia, Pa. 24 pages. The second quarterly issue of this house organ contains an article on rubber cutters, which describes the variety of shears offered by the firm for cutting crude rubber bales. Also included are informative articles on aircraft construction, tensile testing of metals at high temperatures, and the generation of power by means of hydraulic turbines.

"News about du Pont Rubber Chemicals." E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. 16 pages. Included with a news letter, dated June 7, was a report entitled "Sponge Rubber Compounding" by H. Bimmerman, which reviews the principles of sponge rubber compounding and discusses: (1) the raw materials for sponge rubber products; (2) factory handling and processing methods; (3) typical formulas for various sponge rubber products; (4) special types of sponge; and (5) compounding and processing of Neoprene sponge products.

"A Raw Commodity Revolution." Dr. Melvin T. Copeland. Business Research Studies, No. 19. Graduate School of Business Administration, Harvard University, Boston, Massachusetts. 100 pages. Price $1.25. In this report, based on research extending over seven years, the author declares that much of the financial derangement, social distress, and political unrest which has plagued the world during the last 20 years is traceable to a vast revolution in the prices of raw commodities. Professor Copeland states that these revolutionary developments were instigated during the World War, that the revolution has not ended, and that when it is over, the prices for many raw commodities will be permanently lower with relation to other prices than they were prior to 1918 or 1920. The survey embraces data on 19 raw commodities: copper, lead, zinc, tin, silver, nitrogen, petroleum, rubber, sugar, coffee, cocoa, jute, silk, cotton, wool, hides, corn, wheat, and chemical products. For each of the 19, the report recites the major changes in production and consumption, and the important economic or political developments, from 1918 to 1938. For 16 of the commodities, all except nitrogen, petroleum, and chemical products, the report gives monthly average prices in the outstanding world markets from 1934 to 1937, inclusive.

"Farrel-Sykes Gears and Gear Units." Catalog No. 438. Farrel-Birmingham Co., Inc., Ansonia, Conn. Illustrated. 80 pages. This catalog contains descriptive and engineering data on the firm's various types of speed reducing and speed increasing gear units and related products.

"Technical Books of All Publishers." Catalog No. 6. Chemical Publishing Co., 148 Lafayette St., New York, N. Y. This 145-page catalog lists and describes chemical, bacteriological, pharmaceutical, medical, engineering, electrical, and general scientific and other technical books of all American and British publishers. Copies will be sent upon the receipt of 10¢ in stamps or coin to cover mailing costs.

"Foreign Commerce and Navigation of the United States for the Calendar Year 1936." Vol. II. United States Department of Commerce, Bureau of Foreign & Domestic Commerce, U. S. Government Printing Office, Washington, D. C., 1938. Cloth, 541 pages. Indexed. This volume presents statistical tables of foreign commerce of the United States for 1936 covering kinds, quantities, and values of exports; number and tonnage of vessels entered and cleared in foreign trade; value for origin and destination of in-transit and transshipment trade. In addition there are 25 pages of tables which summarize foreign trade for 1936 and previous years. Tables dealing with exports of rubber and rubber manufactures are also included.

"Symposium on Plastics." American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. 51 pages. This pamphlet comprises the six technical papers on plastics delivered at the society's regional meeting in Rochester, N. Y., March 9, 1938. These papers, many of them containing tabular data, and their authors, are as follows: "The Properties of an Ideal Plastic," A. F. Randolph; "A Discussion of Testing Methods for the Determination and Comparison of the Strength Properties of Various Organic Plastics," H. M. Richardson; "A Review of Methods for Measuring the Thermal Properties of Plastic Materials," W. A. Zinzow; "Flow Relations of Thermoplastic Materials," C. H. Penning and L. W. A. Meyer; "Hardness—as Applied to the Plastic Industry," J. C. Pitzer; "Permanence of Plastics," Gordon M. Kline. Copies of the pamphlet can be obtained from the society at 75¢ per copy.

"Let's Take a Look! with W. D. Anderson." Bibb Mfg. Co., Macon, Ga. 14 pages. This booklet briefly outlines the development of tire fabric from the old square-woven type to the present-day fabric made from low-stretch cords. The merits of Bibb's Heat Resistant Cord are discussed in detail in relation to other tire cords on the market. Chief advantages claimed for Bibb cord are: retardation of the generation of heat in the tire, resistance to the effects of heat, maintenance of tire growth at a minimum, and ability to recover quickly from fatigue.

"Accelerateur GRE;" "Accelerateur VS," and **"Antioxygene WBC."** These three booklets from the S.A. des Matieres Colorantes et Produits Chimiques de Saint Denis, Paris, France, give descriptions, results of tests, and formulae for three of its products.

Accelerator GRE (25 pages) is intended for vulcanization with small quantities of sulphur. It is an amorphous white powder, easily soluble in benzene, alcohol, acetone and chloroform, and is used in the proportion of 0.7% to 1% on the weight of rubber, with 1.5% to 2% of sulphur and 5% of zinc oxide. It is used to best advantage in combination with other accelerators; with accelerator TB, for instance, it is employed for insulation mixes for cables, with only 0.5% sulphur. With accelerator D it is recommended for molded goods.

Accelerator VS (21 pages) is an amber liquid (butyraldehyde aniline) soluble in rubber and can be mixed with most of the usual solvents. Normally it is used in the proportion of 0.6% and 1% on the weight of rubber, with 2.5 to 3.75% sulphur, and is specially recommended for tire treads, shoe soles and ebonite.

Antioxygen WBC (13 pages), for light colored goods, is claimed to offer the best protection for mixes cured cold with chloride of sulphur. A white powder, it is non-toxic, insoluble in water, benzene, chloroform, and trichlorethylene, but soluble in acetone. The recommended amount to be used is 0.5% and 1% on the weight of rubber, the smaller amount for very white goods and transparent articles. Its use is said not to affect the action of accelerators, or is any change in the proportion of the latter or of sulphur necessary. Goods containing this material, exposed to light for any length of time, show only slight discoloration and not the brownish tint common with most other antioxygens.

"How Feasible is an Annual Wage for Labor?" No. 27 in a series of booklet-editorials by Allen W. Rucker, in collaboration with N. W. Pickering, president, Farrel-Birmingham Co., Inc., Ansonia, Conn. 16 pages. The authors of this booklet contend that the annual wage is not a cure for the interruption or cessation of the income of wage earners, despite its appearance of value in those respects. The conclusion is drawn that the basic weakness of the annual wage lies exactly where the weakness of the hourly wage rate determined by fiat lies: namely, that the security and continuity of income for employes can result only by removal of rigidities in production costs. The annual wage proposal can be constructive only to the extent that it relieves rigidities in costs and prices; it will be futile to the degree to which it ignores these requirements.

"Rubber" is the name of a new periodical in Dutch put out by the Rubber Stichting (Rubber Foundation) of Amsterdam. The first issue appeared January, 1938, and for the present it is planned to publish the paper every two months. Offices are at Heerengracht 182, Amsterdam, and the editorial board consists of J. G. Fol (chairman), A. D. Zur Muhlen, A. E. M. Nix, and W. F. F. Benz (secretary). The paper, in its red, blue, and gold cover, makes a favorable impression, and the editors have enclosed with each issue a brief note, in English, summing up the contents of the current issue.

"Twenty-fifth Anniversary Blue Book." National Association of Waste Material Dealers, Inc., Times Bldg., New York, N. Y. 407 pages. Illustrated. As a reference book for dealers, producers, and consumers of waste materials, this book contains a list of all classifications, specifications, and trade customs approved by the Association and now in force. A special section is devoted to information for those engaged in foreign trade and includes the names and addresses of sworn weighers, chemists, textile testing companies, public warehouses, and gives government regulations covering import and export of waste materials, etc. Also, a statistical section covering a quarter of a century with market changes and import and export figures on waste materials appears. Classifications for scrap rubber, adopted by the Scrap Rubber Institute, will be found on pages 117 to 122.

"P & H Smootharc Welding Electrodes." Bulletin R-5. Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis. Illustrated. 27 pages. This manual includes spar tests, procedure sheets and other information applicable whether the job is welding Man-Ten steel, chrome steel, stainless steel, manganese steel, nickel steel, etc—and in overhead, downhand, or poor fit positions

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Patents and Trade Marks

MACHINERY

United States

2,117,400. **Apparatus for Covering Articles.** H. Z. Cobb, Providence, R. I., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,117,412. **Tension Device.** W. B. Freeman, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,117,432. **Apparatus to Impregnate Fibrous Sheet Material.** C. E. Linscott, Ridgewood, N. J., assignor to United States Rubber Co., New York, N. Y.

2,117,452. **Cut Seaming Machine.** W. J. Robinson and J. J. Galligan, both of Providence, R. I., assignors, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,118,817. **Device to Insert Washers in Rubber Heels.** L. A. Laursen, Copley, O.

2,119,467. **Tire Recapper.** P. O. Chambers, assignor to Safety Vulcanizer Co., Inc., both of Chicago, Ill.

2,119,495. **Rubber Article Form.** A. N. Spánel, Rochester, N. Y.

2,119,496. **Apparatus to Make Latex Articles.** A. N. Spánel, Rochester, N. Y.

2,119,499. **Latex Article Form.** A. N. Spánel, Dover, Del.

2,120,003. **Dusting Apparatus.** G. H. Schanz, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

Dominion of Canada

373,836. **Vulcanizing Press.** Ohio Rubber Co., assignee of E. M. Winegar, both of Willoughby, O., U. S. A.

373,923. **Strip Tensioning Apparatus.** Boston Woven Hose & Rubber Co., Cambridge, assignee of T. M. Knowland, Belmont, both in Mass., U. S. A.

374,027. **Golf Ball Recoating Machine.** M. F. Holt, Rye, co-inventor with and assignee of S. N. Lipowski, deceased, in his lifetime of New York, both in N. Y., U. S. A.

374,125. **Rubber Thread Making Apparatus.** Société Internationale de Participations Industrielles & Commerciales, S.A., Luxembourg, Luxembourg, assignee of W. M. Spencer, Allentown, Pa., U. S. A.

374,180. **Belt Drive.** Dayton Rubber Mfg. Co., Dayton, O., assignee of E. J. Schmidt, Chicago, Ill., both in the U. S. A.

Germany

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660,462. **Device to Demount Auto Tires.** Steinbock A.G., Moosburg, Oberbayern.

660,502. **Retreading Vulcanizer.** Henry Simon, Ltd., Cheadle Heath, England. Represented by H. Kleinschmidth, Berlin.

United Kingdom

479,080. **Knitting Machine.** R. F. Raven and H. A. Raynor.

480,935. **Disk Mills.** M. Roca and E. Guix.

PROCESS

United States

2,117,305. **Protecting Footwear.** A. H. Feikert, assignor to American Anode, Inc., both of Akron, O.

2,117,418. **Plaited Rubber Article.** M. Hajoway, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,117,532. **Footwear Coating.** R. W. Albright and A. Szegvari, assignors to American Anode, Inc., all of Akron, O.

2,117,824. **Shoe Welt.** E. J. Rogers, Dover, N. H.

2,118,601. **Manufacture of Rubber.** R. H. Gerke, Nutley, G. H. Ganzhorn, West Englewood, and L. H. Howland, Nutley, all in N. J.

2,118,897. **Elastic Filaments.** R. and J. Pickles, both of Burnley, England.

2,119,030. **Latex from Rubber-Producing Plants.** D. Spence, Carmel, Calif.

2,119,412. **Abrasive Wheel.** A. L. Ball, Lewiston Heights, and R. C. Benner, assignors, by mesne assignments, to Carborundum Co., both of Niagara Falls, all in N. Y.

2,119,457. **Belt Dressing for Machinery.** H. V. Dyke, Auckland, New Zealand.

2,119,465. **Rubber Tubes or Fabric Hose.** A. Meyer, assignor to Harburger Gummiwaren-Fabrik Phoenix Aktiengesellschaft, both of Harburg-Wilhelmsburg, Germany.

2,119,482. **Laminated Trimming Strip.** G. H. Huffer, assignor to Backstay Welt Co., both of Union City, Ind.

2,119,620. **Concentrating Rubber Latex.** E. Benzing and J. Jaenicke, both of Frankfurt a.M., Germany, assignors, by mesne assignments, to Revertex, Ltd., London, England.

2,119,932. **Rubber Dust.** M. J. Stam, The Hague, Netherlands.

2,120,120. **Ribbed Separators.** L. E. Wells, Cleveland Heights, assignor to Willard Storage Battery Co., Cleveland, both in O.

2,120,222. **Noninflammable Plastic Mass.** W. D. Spencer, Liverpool, and F. T. Walker, London, both in England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

Dominion of Canada

373,829. **Corrugated Sponge Rubber.** Industrial Process Corp., assignee of H. R. Minor, both of Dayton, O., U. S. A.

373,835. **Abrasive Article.** Norton Co., assignee of D. E. Webster, both of Worcester, Mass., U. S. A.

373,924. **Belting.** Boston Woven Hose & Rubber Co., Cambridge, assignee of J. M. Bierer, Waban, both in Mass., U. S. A.

373,942. **Tire Manufacture.** Cela Holding S.A., assignee of L. S. M. Lejeune, both of Paris, France.

373,950. **V-Belt.** Dayton Rubber Mfg. Co., assignee of A. L. Freedlander, both of Dayton, O., U. S. A.

374,101. **Rubber Distillate Purification.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of F. N. Pickett, London, England.

374,102. **Printing Ink.** B. F. Goodrich Co., New York, N. Y., assignee of R. A. Crawford, Akron, O., U. S. A.

374,160. **Printing Device.** T. C. Jennings, assignee of A. E. Jennings, both of Hamilton, Ont.

374,232. **Stabilized Butadiene Derivative.** Marbon Corp., assignee of H. A. Winkelmann, both of Chicago, Ill., U. S. A.

374,274. **Rubber Hydrochloride Cement Coloring Method.** Wingfoot Corp., Wilmington, Del., assignee of J. A. Merrill, Akron, O., both in the U. S. A.

374,289. **Fiber-Rubber Compound.** F. J. Maywald, and F. J. Maywald, Jr., co-inventors, both of Rutherford, N. J., U. S. A.

United Kingdom

479,120 and 479,121. **Knitting.** W. W. Triggs (W. B. Davis & Sons, Inc.).

479,141. **Reenforced Paper.** W. H. Mills-Paugh.

479,721. **Coating Metal by Extrusion.** J. S. Reid.

479,795. **Adhesive-Coated Fabrics.** D. Sarason.

480,334. **Electrolytic Production of Hyposulphites.** A. Carpmael (I. G. Farbenindustrie A.G.).

Germany

660,592. **Molded Rubber Goods.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands. Represented by R. and M. M. Wirth, C. Weihe, and W. Schalk, all of Frankfurt a.M., and T. R. Koehnhorn and P. Wirth, both of Berlin.

660,652. **Sponge Rubber Articles.** Societa Italiana Pirelli, Milan, Italy. Represented by A. Bursch, Berlin.

CHEMICAL

United States

20,742. (Reissue). **Rubber Paint Solutions.** E. O. Coats, assignor, by direct and mesne assignments, of one-half to H. B. Stratton, five-twentieths to C. Rucker, and five-twentieths to I. Coats, all of Warrensburg, Mo.

2,117,591. **Plastics.** C. H. Alexander, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,117,619. **Ammonium Dithiocarbamate.** R. A. Mathes, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,117,860. **Coloring Agent.** A. Siegel, Roselle, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,118,787. **Painting Composition.** E. C. Clayton and L. L. Heffner, assignors to W. E. Hooper & Sons, all of Baltimore, Md.

2,118,826 and 2,118,827. **Quinone Di-Imides.** W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,119,507. **Resin Composition.** P. M. Clark, Parlin, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,119,508 and 2,119,509. **Coating Composition for Paper.** P. S. Barnhart, Westfield, assignor to Westfield River Paper Co., Inc., Russell, both in Mass.

2,119,600. **Artificial Rubber Dispersion.** F. N. Pickett, London, England, assignor to United States Rubber Products, Inc., New York, N. Y.

2,119,629. **Rubber-like Polymers.** L. van Zütphen, Frankfurt a.M. Hochst, assignor to I. G. Farbenindustrie A.G., Frankfurt a.M., both in Germany.

2,120,054. **Adhesive for Laminated Fabric.** R. M. Freydberg, New York, assignor to Acme Backing Corp., Brooklyn, both in N. Y.

Dominion of Canada

373,799. **Fireproof Cable Compound.** Canadian Westinghouse Co., Ltd., Hamilton, Ont., assignee of J. G. Ford, Forest Hills, and C. F. Hill, Edgewood, co-inventors, both in Pa., U. S. A.

United Kingdom

479,400. **Latex Adhesive.** Versil, Ltd., and C. E. Binns.

479,451. **Accelerators.** E. I. du Pont de Nemours & Co., Inc.

479,464. **Plasticized Halogenated Rubber.** Wingfoot Corp.

479,804. **Compounds for Artificial Fibers.** Standard Oil Development Co.

479,855. **Purified Mercaptothiazoles.** Wingfoot Corp.

480,162. **Coloring Agent.** G. W. Johnson (I. G. Farbenindustrie A.G.).

480,249. **Rubber Color.** A. Carpmael (I. G. Farbenindustrie A.G.).

480,316. **Binding Compositions.** A. G. Bloxam (Soc. of Chemical Industry in Basle).

480,834. **Adhesives.** Vereenigd Industrieel Bezit Veritex N. V.

Germany

660,524. **Solutions of Chlorinated Rubber.** Chemische Fabrik Buckau Ammendorf, Saalkr.

GENERAL

United States

2,117,286. **Garter.** E. Bliesath, Kerry, Ore.

2,117,298. **Plug.** N. Chirelstein, Newark, N. J.

2,117,322. **Fishing Line Shock Absorber.** C. J. Hillman, Spokane, Wash.

2,117,417. **Static Resisting Glove.** S. S. and J. B. Hall, assignors to Surety Rubber Co., all of Carrollton, O.

2,117,419. **Insect Exterminator, Sterilizer, and Drier.** M. M. Hamrick and F. B. Spence, both of New York, N. Y.

2,117,433. **Internal Combustion Engine.** H. Krebs, assignor to Packard Motor Car Co., both of Detroit, Mich.

2,117,449. **Reversible Dress.** M. H. Porter, Brookline, Mass.

2,117,466. **Spectacle Temple Cover.** J. W. Welsh, Providence, R. I., assignor to Welsh Mfg. Co., a corporation of R. I.

2,117,586. **Saw.** C. M. Willson, Bridgeport, Conn., assignor to Raybestos-Manhattan, Inc., Passaic, N. J.

2,117,629. **Hollow Rubber Water Stopper.** H. Rosenthal, Ansonia, Conn.

2,117,641. **Work Holder for Endless Conveyers.** O. E. Westlund, assignor to Mereen Johnson Machine Co., both of Minneapolis, Minn.

2,117,683. **Hydrostatic Brake.** C. Sauzedde, assignor to Detroit Hydrostatic Brake Corp., both of Detroit, Mich.

2,117,766. **Skid Preventer.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O.

2,117,793. **Shuttle Check.** P. Doerseln, Paterson, N. J.

2,117,921. **Hose.** R. Taylor, assignor to Bird & Yeomans, Ltd., both of Earl Shilton, England.

2,117,956. **Picker-Stick Buffer.** M. R. Haupt, Shamokin, Pa.

2,117,974. **Elastic Garment.** J. V. Moore, assignor to Moore Fabric Co., both of Pawtucket, R. I.

2,117,975. **Elastic Fabric.** J. V. Moore, assignor to Moore Fabric Co., both of Pawtucket, R. I.

2,117,997. **Artificial Silk Yarn.** J. I. Taylor, Elizabethton, Tenn., assignor to North American Rayon Corp., New York, N. Y.

2,118,019. **Shoehorn.** W. O. Benjafield, New York, N. Y.

2,118,045. **Artificial Horizon Device.** C. M. Holton, United States Navy.

2,118,051. **Shoe Dauber.** H. R. MacMichael, Piedmont, Calif.

2,118,068. **Means to Support Spring Floors.** J. F. Buckley, Manchester, England.

2,118,085. **Typewriter.** W. F. Helmond, West Hartford, Conn., assignor to Underwood Elliott Fisher Co., New York, N. Y.

2,118,101. **Coated Fabric.** E. H. Nollau, Wilmington, Del., and D. A. Rankin, White Plains, N. Y., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,118,125. **Switch.** F. H. Wells, assignor to Bendix Products Corp., both of South Bend, Ind.

2,118,164. **Racket String.** F. D. Chittenden and H. Manchester, both of Providence, R. I., assignors to United States Rubber Products, Inc., New York, N. Y.

2,118,165. **Life Preserver.** E. T. Christopher and H. E. Murray, both of Denver, Colo., assignors to Lifegard Co., Inc., a corporation of Colo.

2,118,196. **Garment Attachment.** H. K. Harrison, Baltimore, Md.

2,118,249. **Toy.** J. Klarke, Mishawaka, assignor to South Bend Toy Mfg. Co., South Bend, both in Ind.

2,118,300. **Valve and Packing Cartridge.** R. V. Ford, San Francisco, Calif.

2,118,315. **Ball.** D. Levinson, assignor to Standard Sports Mfg. Co., both of Chicago, Ill.

2,118,325. **Ball.** E. B. Peters, assignor to Standard Sports Mfg. Co., both of Chicago, Ill.

2,118,329. **Blood Pressure Tester.** G. A. Snyder, West Hollywood, Calif.

2,118,573. **Steering Wheel Turning Device.** J. Sinko, Chicago, Ill.

2,118,583. **Sweat Band.** S. Adamson, Larchmont, assignor to United States Rubber Products, Inc., New York, both in N. Y.

2,118,595. **Strip Material for Center Spot Crowns.** J. B. Eisen, Yonkers, assignor to F. Gutmann & Co., Brooklyn, both in N. Y.

2,118,629 and 2,118,630. **Electric Cable.** R. C. Waldron, Clifton, assignor to Okonite Co., Passaic, both in N. J.

2,118,677. **Doll.** M. S. Lower, Wadsworth, assignor to Sun Rubber Co., Barberton, both in O.

2,118,682. **Doll.** C. H. Nagel, Akron, assignor to Sun Rubber Co., Barberton, both in O.

2,118,702. **Wheel.** E. W. French, Haines, Alaska.

2,118,774. **Tire.** S. M. Cadwell, Grosse Pointe Village, Mich., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,118,797. **Underwear.** B. Sanders, South Orange, N. J., assignor to Manhattan Shirt Co., New York, N. Y.

2,118,841. **Floor Covering.** A. Elmendorf, Chicago, Ill.

2,119,016. **Heel.** C. Lamb, South Pasadena, Calif.

2,119,068. **Key Container.** H. S. Baughman, Barberton, and M. S. Lower, Wadsworth, assignors to Sun Rubber Co., Barberton, all in O.

2,119,133. **Toy.** K. P. Hogan, assignor to Hogan Inventions, Inc., both of Philadelphia, Pa.

2,119,146. **Light Socket and Switch.** C. A. Adams, Davenport, Iowa.

2,119,180. **Tire Pump.** H. B. Russell, Morecambe, England.

2,119,204. **Device for Cooling Tires.** M. L. Donnellan, Kalamazoo, Mich.

2,119,287. **Tire Gage.** R. J. Pratt, Cochrane, Alberta, Canada.

2,119,300. **Bathing Cap and Case.** A. N. Spánel, Rochester, N. Y.

2,119,330. **Cap.** M. H. Hirsh, South Orange, N. J.

2,119,394. **Cable.** E. H. Lewis, Union, N. J., and C. O. Hull, Stratford, Conn., assignors to General Electric Co., a corporation of N. Y.

2,119,429. **Protective Beading for Fenders.** H. L. Fletcher, Toronto, Ont., Canada.

2,119,446. **Self-Administration of Anesthetics.** J. G. Sholes, assignor to Ohio Chemical & Mfg. Co., both of Cleveland, O.

2,119,479. **Lug Strap.** H. M. Bacon, Warren, assignor to Dayton Rubber Mfg. Co., Dayton, both in O.

2,119,497. **Panties.** A. N. Spánel, Rochester, N. Y.

2,119,498. **Rubber Article.** A. N. Spánel, Rochester, N. Y.

2,119,537. **Container for and Dispenser of Ribbon-Like Material.** G. H. Halpin, assignor to Minnesota Mining & Mfg. Co., both of St. Paul, Minn.

2,119,557. **Tire.** B. F. Randel, San Diego, Calif.

2,119,602. **Riding Breeches.** E. F. Roberts, Rye, and S. Adamson, Larchmont, assignors to United States Rubber Products, Inc., New York, all in N. Y.

2,119,623. **Tire Valve.** W. F. Goff, Akron, O.

2,119,645. **Fountain Pen.** E. G. Pearson, Roselle, N. J.
2,119,691. **Calf Feeder.** E. G. Vanderbilt, Aurora, Colo.
2,119,735. **Tire Inflater and Ventilating Device.** N. D. Campbell, Hackensack, N. J.
2,119,745. **Packing Ring.** R. C. Ingersoll, assignor to Borg-Warner Corp., both of Chicago, Ill.
2,119,773. **Coin Container and Assorter.** E. G. Buckner, North Hollywood, Calif.
2,119,796. **Fountain Pen.** S. M. Sager, Hubbard Woods, Ill.
2,119,863. **Machine to Measure and Mark Sheets of Material.** P. A. van Kempen, Zittau, Germany.
2,119,921. **Toy Building Blocks, Tiles, Etc.** A. Levy, assignor to Premo Rubber Co., Ltd., both of Petersfield, England.
2,120,017. **Weather Strip.** R. B. Calcutt, Chicago, Ill.
2,120,059. **Fountain Pen.** F. Moore, assignor to Wahl Co., both of Chicago, Ill.
2,120,063. **Tire.** P. M. Bourdon, Paris, assignor to Michelin & Cie, Clermont-Ferrand, both in France.
2,120,095. **Cable.** J. W. Greenleaf, Hamden, Conn., assignor to Rockbestos Products Corp., a corporation of Mass.
2,120,098. **Wheel.** C. J. Hug, Highland, Ill.
2,120,144. **Loom Binder.** H. I. Emmons, Methuen, Mass.

Dominion of Canada

373,843. **Rail Truck.** Transit Research Corp., assignee of E. H. Piron, both of New York, N. Y., U. S. A.
373,951. **Mesh Belt.** Dayton Rubber Mfg. Co., assignee of A. L. Freedlander, both of Dayton, O., U. S. A.
374,072. **Pipe Fixing.** F. J. T. Barnes, Newstead, Brisbane, Australia.
374,081. **Centrifugal Pump.** Allen-Sherman-Hoff Co., assignee of F. B. Allen, both of Philadelphia, Pa., U. S. A.
374,084. **Windshield Wiper.** Anderson Co., assignee of C. Bramming, both of Gary, Ind., U. S. A.
374,103. **Sealing Strip.** B. F. Goodrich Co., New York, N. Y., assignee of N. H. Dewhirst, executrix of estate of H. Dewhirst, deceased, and E. Meyer, co-inventor with the said H. Dewhirst, all of Akron, O., both in the U. S. A.
374,106. **Glass Nozzle.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands, assignee of A. W. Keen, Passaic, N. J., U. S. A.
374,107. **Interwound Film Material.** Marathon Paper Mills Co., Rothschild, assignee of A. Abrams and G. W. Forcey, both of Wausau, and C. L. Wagner, Rothschild, co-inventors, both in Wis., U. S. A.
374,119. **Windshield Wiper.** Productive Inventions, Inc., assignee of J. W. Anderson, both of Gary, Ind., U. S. A.
374,142. **Elastic Fabric.** H. A. and M. E. Smith, co-inventors, both of Fairfield, Conn., U. S. A.
374,208. **Overshoe.** Cambridge Rubber, Ltd., St. Remi de Napierville, P. Q., assignee of E. W. Dunbar, Hudson, Mass., U. S. A.
374,248. **Soap Composition.** Shell Development Co., San Francisco, assignee of E. N. Klemgard, Martinez, both in Calif., U. S. A.
374,285. **Mat.** Wingfoot Corp., Wilmington, Del., assignee of H. R. Russon, Akron, O., both in the U. S. A.
374,312. **Footwear.** J. N. Kimpton, Newport, England.

United Kingdom

464,822. **Hydraulic Transmission of Power.** D. W. Sessions and D. Sessions & Co., Ltd.
472,719. **Linkages for Conveying Circular Motion.** G. H. Schieferstein.
478,838. **Cables.** Callender's Cable & Construction Co., Ltd., L. G. Brazier, and G. M. Hamilton.
478,845. **Pipe Joints.** H. P. Smith.
478,876. **Endless Vehicle Track.** Zavody Tatra Akciova Spolecnost Pro Stavbu Automobilu a Zeleznicnich Vozu.
479,029. **Floor.** J. H. Walker.
479,175. **Motor Vehicles.** W. W. Constantine (A. Opel A.G.).
479,203. **Glass-Cleansing Machine.** T. A. Clarke, J. Malin, and G. F. Hinks.
479,216. **Road Vehicles.** S. Barker and R. A. Dyson & Co., Ltd.
479,240. **Coconut Fiber Slivers.** B. G. H. Van Der Jagt.
479,249. **Looms.** J. Braun.
479,401. **Electrolytic Condensers.** British Thomson-Houston Co., Ltd.
479,520. **Oscillating Motors.** Scholl Mfg. Co., Ltd., and G. Thornton-Norris.
479,610. **Hair Curler.** Jarrett, Rainsford & Laughton, Ltd., and G. A. Laughton.
479,622. **Mudguards.** J. Kirkness.
479,629. **Universal Joint.** L. Ricefield.
479,633. **Spring.** Soc. Anon. Solex.
479,638. **Shaft Coupling.** Getefo Ges. Fur Technischen Fortschritt.
479,646. **Liquid Dispenser.** P. Brandle.
479,654. **Window Frame.** J. S. Reid.
479,655. **Hydrostatic Apparatus.** C. A. Voigt.
479,660. **Top Lift for Shoes.** Wingfoot Corp.
479,724. **Batteries.** Chloride Electrical Storage Co., Ltd., (L. E. Lighton).
479,726. **Bottle Crate.** J. H. M. Brett, and R. Ransom.
479,735. **Electro-Medical Apparatus.** S. Siebs.
479,740. **Vacuum Cleaner Motor Unit.** Electrolux, Ltd.
479,757. **Conveyer Drum.** B. J. Marson and Doncaster Collieries Association (Sales), Ltd.
479,786. **Glass Cleaner.** Kleenglas (1935), Ltd., and A. Griffiths.
479,800. **Hose.** R. Bosch A.G.
479,809. **Flooring.** J. G. Dugdall and Hollis Bros. & Co., Ltd.
479,868. **Seat.** A. H. W. Hague.
479,948. **Wallboards.** W. W. Triggs (Celotex Corp.).
479,954. **Mop.** E. Rutter.
479,958. **Mats.** J. H. Wray.
479,960. **Mattress.** Hairlok Co., Ltd., and J. A. Howard.
480,068. **Machinery Supports.** P. Linke, trading as P. Linke & Co.
480,120. **Fibrous Compositions.** M. K. Kirchbach.
480,157. **Machine to Make Cutting Tools.** F. Eisner.
480,193. **Signalling Device.** E. T. March.
480,225. **Discharge Lamp.** H. G. G. Desmarest.
480,232. **Grinding Mill for Condiments.** Mantelet & Boucher.
480,317. **Tool Carrier.** A. H. Stevens (Leland Electric Co.).
480,405. **Gas Blast Switch.** F. Strauss.
480,451. **Driving Belt.** P. T. Evans, J. H. Wright, and H. Brammer.
480,510. **Couplings.** British Thomson-Houston Co., Ltd.
480,541. **Automatic Control Systems.** Allmanna Svenska Elektriska Aktiebolaget.
480,542. **Liquid Resistance.** W. Crockatt & Sons, Ltd., and W. C. Crockatt.
480,554. **Casting Machines.** Deutsche Edelstahlwerke A.G.
480,724. **Condensers.** Marconi's Wireless Telegraph Co., Ltd.
480,727. **Tire Valves.** Scovill Mfg. Co. and W. J. Winter.
480,738. **Mounting Rotors.** Rotative Mechanisms, Ltd.
480,780. **Doors to Resist Fluid Pressure.** Soc. Nessi Freres & Cie, and J. Massin.
480,877. **Apparatus to Dye Textile Articles.** British Schuster Bates Machine Co., Ltd.

Germany

660,229. **Rubber Sheet.** J. Grabec and A. von Ledofsky, both of Pressburg, Czechoslovakia. Represented by C. B. E. von Bornegg, Berlin.
660,452. **Floor Covering.** C. Oesterreich, Berlin.

TRADE MARKS

United States

356,550. Representation of a diamond containing the word: **"Qualatex."** Balloons. Pioneer Rubber Co., Willard, O.
356,602. **Invader.** Heels. Essex Rubber Co., Trenton, N. J.
356,627. Label containing representation of an automobile and the words: **"At the Sign of the Red Automobile."** Brake lining material. B. F. Goodrich Co., Akron, O.
356,702. **Phantolastic.** Elastic stockings. I. F. Spindell, doing business as Curtis & Spindell, Lynn, Mass.
356,706. Representation of a mechanical man holding a placard. Gaskets and non-metallic washers. Armstrong Cork Products Co., Lancaster, Pa.
356,708. Label containing representation of an elephant and the words: **"Ganesh Ganesh."** Erasers. J. S. Staedtler, Nuremberg, Germany.
356,736. **Thermo-Cure Tire Company.** Tires. L. L. Lane, doing business as Thermo-Cure Tire Co., Washington, D. C.
356,890. **Flywheel Action.** Golf balls. F. H. Cavignac, Glendale, N. Y.
356,938. **Flexo-Flo.** Gasoline dispersing nozzles. Gates Rubber Co., Denver, Colo.
357,190. **Selenac.** Accelerator. R. T. Vanderbilt Co., Inc., New York, N. Y.
357,208. **Monat.** Prophylactic articles. W. H. Reed & Co., Inc., Atlanta, Ga.
357,220. **Wintark.** Basketballs. Wintark Co., Cicero, Ill.
357,234. **Hi-Grader.** Belting. Lee Rubber & Tire Corp., Youngstown, O.
357,235. **Luxor.** Rubber cement. B. K. Elliott Co., Pittsburgh, Pa.
357,260. **Paramount.** Batteries. Johnson Tire & Supply Co., Montgomery, Ala.
357,268. **Cavalon.** Rubber-coated fab-

rics. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

357,290. **Cell-Tite.** Rugs and sheet coverings. Sponge Rubber Products Co., Derby, Conn.

357,301. **Minralex.** Ground shale. Binney & Smith Co., New York, N. Y.

357,423. Representation of two diamonds with the letter: **"G"** between them. Gloves, footwear, bathing suits, and bathing caps. B. F. Goodrich Co., New York, N. Y.

357,426. **Alley Oop.** Balloons and games. NEA Service, Inc., Cleveland, O.

357,439. **Marvel.** Mechanical rubber goods. La Favorite Rubber Mfg. Co., Hawthorne, N. J.

357,444. **Radio Police.** Raincoats. Puritan Raincoat Co., Inc., New York.

357,450. **Qualatex.** Gloves. Pioneer Rubber Co., Willard, O.

357,455. **Kurlox.** Combs. American Hard Rubber Co., Hempstead, N. Y.

357,460. Representation of an elfin creature combing out his whiskers, and the word: **"Puck."** Combs. New York Hamburger Gummi-Waaren Compagnie, Hamburg, Germany.

357,467. Representation of an eraser containing the words: **"Blue Band."** Erasers. American Lead Pencil Co., New York, N. Y.

357,474. Label containing representation of a baby and the words: **"What-A-Baby."** Rubber pants. McCrory Stores Corp., New York, N. Y.

357,488. **Coronet.** Heels and soles. Holtite Mfg. Co., Inc., Baltimore, Md.

357,533. **Intrigue.** Corsets, brassieres, garter belts, etc. Beautee-Fit Co., Inc., Los Angeles, Calif.

357,540. Representation of a shield containing the letter: **"R."** Soles and heels. Goodyear Tire & Rubber Co., Akron, O.

357,541. **Resolute.** Soles and heels. Goodyear Tire & Rubber Co., Akron, O.

357,542. **Expanso.** Suspenders, garters, etc. Knothe Bros. Co., Inc., New York, N. Y.

357,548. **Old Hundred.** Garters and suspenders. Knothe Bros. Co., Inc., New York, N. Y.

357,605. **Gossiper.** Corsets, girdles, brassieres, etc. H. W. Gossard, Co., Chicago, Ill.

357,633. **Greyhound.** Suspenders, belts, garters, etc. H. Englander, Philadelphia, Pa.

357,661. **Bill Thompson.** Golf balls. Chicago Golf Ball Co., Inc., Chicago, Ill.

357,662. **Nome.** Footwear. J. C. Penney Co., Wilmington, Del.

OHIO

(*Continued from page* 58)

Hisey, production service, Goodyear Tire & Rubber Co., Akron; special conference, "The Foremen's Club Yearly Program," leader, H. G. Evans, of Goodyear, also president of the National Association of Foremen; "What the Employe Thinks," A. C. Horrocks, public relations, Goodyear; "Working with Organized Labor," J. M. Baker, personnel director, Crosley Radio Corp., Cincinnati, O.: "What the Foreman Should Know About Unemployment Insurance," illustrated with charts, W. C. Wright, supervisional training, Goodyear; "The Foreman's Responsibility to His Community," J. L. Prosser, general secretary, Akron Y.M.C.A.; and "Is the Foreman Doomed as a Manager?" Merritt Lum, industrial counsellor, Daniel Starch & Staff, New York, N. Y.

Rubber men who served on various Conference committtees follow: registration, chairman, N. N. Alspach, Goodyear, secretary-treasurer of the association, and T. E. Boyle, Goodrich; program, co-chairman, Mr. Evans, C. L. Murchison, Goodrich, and Alvin Woolcot, Sieberling Rubber Co., Barberton, O.; reception, chairman, Don Coe, Goodrich, J. A. Hamilton, Goodyear, and F. F. Cleckner, Seiberling; entertainment, chairman, Harry L. Pastorius, Goodyear, and M. B. Griffith, Goodrich; finance, chairman, C. O. Wright, Goodrich, and D. P. Jones, Goodyear; and promotion and advertising, Hugh Allen, Goodyear.

The Lithox Corp., Wapakoneta, recently was incorporated, with a capital of $100,000, to take over The S & K Rubber Co., Lima, but officers remain the same: A. F. Smith, president; R. S. Kimball, vice president; Ed. Johnson, treasurer; and W. G. Montgomery, secretary. The new company will manufacture the products of the S & K concern, known to the trade by its Metal Flex soles and heels. The product used for soles and heels, of a high-grade material said to be superior to carbon as to abrasion and non-marking, is combined with tire cord at the base of the sole and heel in such a manner as to prevent spreading and bulging with Lithox tread, which, it is claimed, does not become rough and ragged when worn. It can be used on semi-dress shoes without preventing an untidy appearance, giving the benefit of the rugged wearing results required of heavy service shoes. The cord is said to be so arranged as to prevent the burning sensation sometimes felt in other materials. Lithox consists of mineral and organic materials with cotton as an insulator base having a cushion under the ball of the foot to give comfort.

Faultless Rubber Co., Ashland, announced that C. D. Hubler recently was named president to fill the unexpired term of the late W. H. Balch.

The Aetna Rubber Co., 815 E. 79th St., Cleveland, announced that at a directors' meeting last month Charles A. Hell resigned as president and was elected chairman of the board.

Eagle-Picher Sales Co., Cincinnati, recently elected two new vice presidents: Wm. H. Hayt and Miles M. Zoller, general manager of the white lead and of the pigment divisions, respectively.

MIDWEST

(*Continued from page* 56)

"Floor Covering." The Turner patent related to a floor covering comprised of a rubber tread and a felt base reenforced with burlap; while the Vrooman patent related to a similar type of mat except that the felt was cut back from the edges so that the rubber would hide the "whiskers" and fit snugly to the floor. Judge Tuttle held both patents invalid on the ground that the alleged inventions were old in the art long before either Turner or Vrooman had filed their applications.

Bath Sprays Provide for Water Softening

Stationary and portable suction cup wall showers and bath sprays are being equipped with an insert fitting, sold under the trade name "Zest," into which a perfumed water-soluble tablet is inserted, which is claimed to soften the water and at the same time create a pleasant fragrant odor.

BOOK REVIEW

"Kautschuk: Wandlungen in der Erzeugung und der Verwendung des Kautschuks nach dem Weltkrieg." Dr. Heinz George. Published by Bibliographisches Institut A.G., Leipzig, Germany. Paper, 210 pages, 6¼ by 9 inches.

Changes in production and use of rubber after the world war form the subject of this book, which is number nine in the series "Wandlungen in der Weltwirtschaft" (Changes in World Economics), edited by Geheimrat Prof. Dr. Hermann Schumacher, LL.D. Clearly, impartially, and without going into too great detail, Dr. George presents his graphic survey which he divides into four parts: Changes in Rubber Consumption, Changes in Rubber Production, Market Problems, and Attempts at Market Regulation.

In the first section the part played by the United States as consumer of rubber and the developments of American consumption for tires and other rubber goods receive special attention. The most important developments in the production of crude rubber, the financial set-up of estates with itemized cost of production and latest estate methods, as well as recent work in synthetic rubber, are next covered. The problems of stocks and price fluctuations are then briefly, but clearly discussed. The final section discusses the Stevenson Restriction Scheme, its effects on non-British planting in the Far East, American experiments in planting rubber in Africa and South America, the lessons taught by the mistakes in connection with this scheme, and lastly the slump after 1929 and the present rubber regulation scheme.

Numerous tables have been intro-

(*Continued on page* 82)

Market Reviews

CRUDE RUBBER

Commodity Exchange

TABULATED WEEK-END CLOSING PRICES

Futures	Apr. 30	May 28	June 4	June 11	June 18	June 25
May	11.25	.....	.....	.....	.....	.....
June	11.29	11.29	11.25	12.00	12.22	13.94
July	11.34	11.31	11.27	12.02	12.24	13.96
Sept.	11.48	11.45	11.40	12.12	12.38	14.12
Dec.	11.67	11.63	11.57	12.29	12.53	14.22
Mar.	11.83	11.78	11.71	12.43	12.70	14.37
May	.....	.....	11.81	12.56	12.82	14.45
Volume per week (tons)	23,300	9,780	10,270	14,940	10,830	31,210

New York Quotations

New York outside market rubber quotations in cents per pound

	June 26, 1937	May 26, 1938	June 27, 1938
Plantations			
Rubber latex...*gal.*	72/73	44/45	54/55
Paras			
Upriver fine	20	11½	13¼
Upriver fine	*26	*15⅜	*16¼
Upriver coarse	13¼	8	9
Upriver coarse	*19	*12	*13
Islands fine	19	11	13
Islands fine	*26	*14¾	*15½
Acre, Bolivian fine	20½	11¾	13½
Acre, Bolivian fine	*26	*15½	*16½
Beni, Bolivian fine	21½	12½	13¾
Madeira fine	20	11½	13¼
Caucho			
Upper ball	13¼	8¼	9
Upper ball	*19	*12	*13
Lower ball	13	8	8¾
Pontianak			
Pressed block	10¼/31	11/28	12/25
Guayule			
Duro, washed and dried	16	10½	10½
Ampar	16½	11	11
Africans			
Rio Nuñez	20	13¼	15
Black Kassai	19	13¼	15
Prime Niger flake.	28	23	24
Gutta Percha			
Gutta Siak	10½	13	11½
Gutta Soh	16¾	16¼	16
Red Macassar	1.20/1.35	1.00/1.25	1.25/1.30
Balata			
Block, Ciudad Bolivar	30	..	27
Manaos block	28	27	27
Surinam sheets	38	35	37
Amber	40	37	39

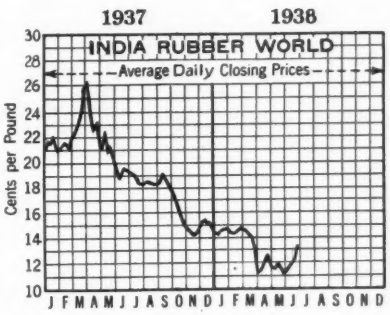
*Washed and dried crepe. Shipments from Brazil.

THE Commodity Exchange table published here shows prices of representative future contracts on the New York market the past two months.

Despite the fact that the export quota was reduced to 45% for the third quarter, the price of September futures dropped from 11.58¢ per pound on May 31, the day of the announcement, to 11.40¢ on June 3; the drop was influenced by poor consumption prospects. However with increased buying by factory accounts and commission houses, the price thereafter rose steadily through the month to close at 13.47¢ per pound on June 22. The closing price on June 29 was 14.80¢ per pound. The upturn was sharpest during the latter part of the month when the market rallied along with the securities exchange. May consumption figures showing an increase of 3.4% over April had little effect on the price trend. During the past four weeks the maximum variation in prices for delivery during the next year was 0.60¢.

For the first five months of the year, consumption of crude rubber in the United States has totaled 140,715 tons, as compared with 260,612 tons during the like period of 1937, and is the lowest for any comparable period since 1933, when consumption for the first five months of the year amounted to 131,882 tons. Although May consumption figures showed an increase of almost 1,000 tons over April, it is the smallest May figure in more than 12 years. A feature of the May statistics was the fact that domestic crude stocks declined during the month for the first time since July, 1937. On the following page are reported United States statistics on imports, consumption, stocks, and crude rubber afloat.

According to a study by the Commodity Exchange, Inc., world absorption so far this year of 68,826 tons on a monthly average has very closely followed permissible exports for all countries participating in the regulation agreement including Siam and French Indo-China and which amounts to 68,797 tons on a monthly average for the first nine months of this year. U. S. consumption decreased by 23,979 tons, or 46% on a monthly average so far this year as compared with 1937; while absorption abroad has decreased only 2,357 tons, or 5.5% on a monthly average. World absorption outside of the U. S. this year amounts to 40,683 tons monthly, and consumption in the U. S. has averaged 28,143 tons a month.



New York Outside Market—Spot Ribbed Smoked Sheets

New York Outside Market

The outside market was generally quiet during the first part of the past month. Toward the end of June factory interest improved, and shipment offerings were being accepted in larger amounts. After closing at 11⅜¢ per pound on May 31 the price of ribbed smoked sheets moved upward during the month to close at 13¼¢ per pound on June 22. On June 29 the spot closing price was 14¾¢ per pound.

The week-end closing prices on No. 1 ribbed smoked sheets follow: June 4, 11¼¢; June 11, 12¢; June 18, 12¼¢; June 25, 13$\frac{13}{16}$¢.

New York Outside Market—Spot Closing Prices—Plantation Grades—Cents per Pound

	May, 1938 30*	31	June, 1938 1	2	3	4†	6	7	8	9	10	11†	13	14	15	16	17	18†	20	21	22	23	24	25†
No. 1 Ribbed Smoked Sheet	..	11⅜	11⅜	11	11¼	..	11½	11½	11¾	12	12	..	11⅞	12	12⅛	12⅛	12¼	..	12⅛	12⅛	13¼	13⅜	13⅛	..
No. 2 Ribbed Smoked Sheet	..	11	11	10⅛	10⅞	..	11⅛	11⅛	11⅜	11¾	11⅝	..	11⅞	11⅝	11¾	11¾	11⅞	..	12⅛	12⅞	12⅞	13⅛	13⅛	..
No. 3 Ribbed Smoked Sheet	..	10½	10⅞	10⅜	10⅜	..	10⅝	10⅝	10⅞	11⅛	11⅛	..	10⅞	11⅛	11⅛	11⅛	11⅛	..	11⅛	11⅛	12⅛	12⅝	12⅞	..
No. 4 Ribbed Smoked Sheet	..	10⅜	10⅛	10¼	10¼	..	10½	10½	10¾	11	10⅛	..	10⅛	10⅛	11⅛	11⅛	11⅛	..	11⅝	11¾	12⅛	12½	12¾	..
No. 1 Thin Latex Crepe	..	12½	12¾	12⅞	12⅜	..	12⅝	12⅝	12⅞	13	13	..	12⅞	13	13	13	13½	..	13⅛	13¾	14¼	14½	14¾	..
No. 1 Thick Latex Crepe	..	12⅞	12⅞	12⅛	12⅛	..	13⅛	13⅛	13⅜	13⅝	13⅝	..	13½	13½	13⅝	13⅝	13¾	..	14⅛	14⅛	14¾	15⅛	15¼	..
No. 1 Brown Crepe	..	10½	10½	10⅞	10⅜	..	10⅝	10⅝	11	11¼	11⅛	..	10⅛	11⅛	11¼	11¼	11⅜	..	11⅛	11⅛	12⅜	12⅛	12⅛	..
No. 2 Brown Crepe	..	10⅜	10⅜	10⅛	10¼	..	10½	10½	10⅞	11⅞	11	..	10¾	11	11⅛	11⅛	11¼	..	11⅛	11⅛	12¼	12⅛	12⅛	..
No. 2 Amber	..	10½	10½	10⅞	10⅜	..	10⅝	10⅝	11	11⅛	11¼	..	10⅛	11⅛	11¼	11¼	11⅜	..	11⅛	11⅛	12⅜	12⅛	12⅛	..
No. 3 Amber	..	10⅜	10⅜	10⅛	10¼	..	10½	10½	10⅞	11⅛	11⅛	..	10⅛	11	11⅛	11⅛	11¼	..	11⅛	11⅛	12¼	12⅛	12⅛	..
No. 4 Amber	..	10⅛	10⅛	9⅞	9⅛	..	10⅛	10⅛	10⅛	10⅝	10⅝	..	10⅜	10⅝	10¾	10¾	10⅞	..	11⅛	11⅜	11⅞	12⅛	12⅞	..
Rolled Brown	..	8$\frac{15}{16}$	8$\frac{15}{16}$	8⅞	8$\frac{15}{16}$	..	9$\frac{1}{16}$	9$\frac{1}{16}$	9$\frac{1}{16}$	9$\frac{1}{16}$	9$\frac{1}{16}$	..	9⅛	9⅜	9⅜	9⅜	9$\frac{1}{16}$	..	10¼	10¼	10$\frac{15}{16}$	11⅛	11$\frac{1}{16}$	..

*Holiday. †Closed.

IMPORTS, CONSUMPTION, AND STOCKS

United States and World Statistics of Rubber Imports, Exports, Consumption, and Stocks

Twelve Months	U. S. Imports* Tons	U. S. Consumption§ Tons	U. S. Stocks Mfgrs. Importers, Dealers, Etc.† Tons	U. S. Stocks Afloat†† Tons	U. K.— Public Warehouses, London, Liverpool†‡ Tons	Singapore and Penang Dealers and Port Stocks†‡ Tons	World Production (Net Exports)‡ Tons	World Consumption Estimated‡ Tons	World Stocks†‡‖ Tons
1936	490,858	575,000	223,000	56,567	78,462	26,969	855,600	1,044,195	538,028
1937	584,851	543,600	262,204	63,099	57,785	44,792	1,135,029	1,093,916	639,025
1937									
January ...	32,820	50,879	204,436	55,096	71,062	36,365	71,448	**92,979	521,472
February ..	43,289	51,950	195,692	53,538	63,760	42,132	70,477	93,080	511,394
March	52,039	54,129	192,980	56,994	52,077	42,485	102,222	104,412	522,783
April	35,850	51,859	176,289	72,530	48,748	38,812	89,375	93,519	498,573
May	50,840	51,795	175,273	58,542	46,628	34,234	86,536	101,281	491,186
June	48,956	51,860	172,056	57,215	43,427	45,085	95,477	101,851	521,359
July	39,108	43,703	167,094	75,779	42,175	44,759	111,751	89,772	522,720
August	48,785	41,506	174,195	80,439	45,211	47,873	102,286	89,927	537,017
September..	56,049	43,945	186,193	83,288	49,807	49,438	106,846	91,784	549,518
October ...	52,508	38,754	200,025	80,653	51,932	41,948	100,671	84,305	555,818
November..	56,302	34,025	222,707	81,302	54,857	38,778	94,218	78,965	575,922
December...	68,305	29,195	262,204	63,099	57,785	44,792	103,722	70,521	639,025
1938									
January ...	42,135	29,429	274,581	57,356	62,108	48,494	80,282	70,019	a634,330
February...	43,930	23,868	294,338	47,459	71,516	46,241	81,039	61,003	a653,791
March	35,967	30,487	299,172	41,882	76,617	50,797	81,531	78,079	a670,288
April	30,807	27,984	301,436	39,071	82,754	40,614	86,743	67,667	a567,218
May	27,410	28,947	299,720	32,859	.....	.....	.....	.....	.....

*Including liquid latex. †Stocks on hand the last of the month or year. ‡Statistical Bulletin of the International Rubber Regulation Committee. §Stocks at U. S. A., U. K., Singapore and Penang, Para, Manaos regulated areas, and afloat. ¶Corrected to 100% from estimate of reported coverage. **Not including additional absorption from U.K. manufacturers' stocks for any month during 1937. The figure will be included in yearly total. aJapan stocks not included.

CRUDE rubber consumption by United States manufacturers during May is estimated at 28,947 long tons, against 27,984 long tons during April, a 3.4% gain, but 44.1% under the 51,795 (revised) long tons consumed in May, 1937, according to R.M.A. statistics.

Gross imports of crude rubber for May are reported to be 27,410 long tons, 11% under the April figure of 30,807 long tons and 46.1% under the May, 1937, figure of 50,840 long tons.

Total domestic stocks of crude rubber on hand May 31 are estimated at 299,720 long tons, compared with April 30 stocks of 301,439 long tons and 175,273 long tons on hand May 31, 1937.

Crude rubber afloat to United States ports as of May 31 is estimated at 32,859 long tons, against 39,071 long tons afloat on April 30 and 58,542 long tons afloat on May 31 a year ago.

London and Liverpool Stocks

Week Ended	Tons London	Liverpool
June 4.....	57,876	29,961
June 11.....	58,005	29,921
June 18.....	59,131	30,858
June 25.....	59,778	31,307

U. S. Crude and Waste Rubber Imports for 1938

	Plantations	Latex	Paras	Africans	Centrals	Guayule	Totals 1938	Totals 1937	Balata	Miscellaneous	Waste
Jan. .....tons	39,744	1,259	411	177	6	538	42,135	32,820	41	526	8
Feb.	41,709	1,400	453	150	..	218	43,930	43,289	35	808	22
Mar.	34,252	861	371	278	..	205	35,967	52,039	37	555	93
Apr.	29,662	690	324	...	1	130	30,807	35,850	73	1,046	33
May	25,967	696	195	326	1	225	27,410	50,840	32	647	5
Total 5 mos., 1938.....tons	171,334	4,906	1,754	931	8	1,316	180,248	.....	218	3,582	161
Total 5 mos., 1937.....tons	200,710	8,880	3,973	354	55	866	.....	214,838	121	3,529	1,957

Compiled from The Rubber Manufacturers Association, Inc., statistics.

World Net Imports of Crude Rubber

Year	U.S.A.	U.K.†	Australia	Belgium	Canada	Czechoslovakia	France	Germany	Italy	Japan	Russia	Rest of the World	Total
1936	475,500	62,700	14,400	9,600	27,900	8,800	56,800	71,800	16,000	61,700	31,000	64,600	831,300
1937	592,528	137,351	19,257	14,969	36,087	13,063	59,959	98,170	23,980	62,205	30,462	67,745	1,110,856
1938													
Jan.	45,596	17,811	617	1,258	1,789	1,102	4,780	6,314	1,809	4,935	693	5,292	89,643
Feb.	40,977	19,149	621	974	615	1,771	5,420	6,959	2,000	3,173	2,341	5,432	86,788
Mar.	42,075	18,134	1,084	961	2,000*	1,323	4,823	10,768	1,365	6,222	2,000*	5,564	94,097

*Estimated. †U. K. figures show gross imports, not net imports. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

RUBBER SCRAP

WITH buying sentiment slightly improved, the demand for scrap rubber during the past few weeks increased somewhat over that of May. The prices of all grades of scrap remain at last month's levels.

CONSUMERS' BUYING PRICES

(Carload Lots Delivered Eastern Mills)
June 25, 1938

		Prices
Boots and Shoes		
Boots and shoes, black	lb.	$0.01 /$0.01½
Colored	lb.	.00¾/ .00¾
Untrimmed arctics	lb.	.00¾/ .00¾
Inner Tubes		
No. 1, floating	lb.	.08½/ .09
No. 2, compound	lb.	.03¼/ .03½
Red	lb.	.03¼/ .03½
Mixed tubes	lb.	.02¾/ .03
Tires (Akron District)		
Pneumatic Standard		
Mixed auto tires with beads	ton	10.50 /10.75
Beadless	ton	14.00 /14.50
Auto tire carcass	ton	15.00 /16.00
Black auto peelings	ton	15.00 /16.00
Solid		
Clean mixed truck	ton	23.00 /24.00
Light gravity	ton	30.00 /32.00
Mechanicals		
Mixed black scrap	ton	17.00 /18.00
Hose, air brake	ton	16.00 /17.00
Garden, rubber covered	ton	11.00 /12.00
Steam and water, soft	ton	10.00 /10.50
No. 1 red	lb.	.02¼/ .02½
No. 2 red	lb.	.01¾/ .01⅞
White druggists' sundries	lb.	.03⅛/ .03¼
Mechanical	lb.	.01¼/ .01½
Hard Rubber		
No. 1 hard rubber	lb.	.10¾/ .11¼

Tire Production Statistics

Pneumatic Casings

	Inventory	Production	Shipments
1935	8,195,863	49,338,157	50,176,898
1936	11,114,399	58,116,349	55,362,739
1937	10,767,799	55,284,415	55,466,329
1938			
Jan.	10,987,967	2,776,046	2,500,148
Feb.	10,833,036	2,238,167	2,359,098
Mar.	10,819,552	2,792,440	2,890,749
Apr.	10,316,774	2,705,606	3,199,363
May	9,855,360	2,841,549	3,372,118

Inner Tubes

	Inventory	Production	Shipments
1935	8,231,351	47,650,811	47,998,054
1936	10,985,273	57,247,553	54,624,321
1937	10,235,517	51,986,167	52,376,657
1938			
Jan.	10,164,141	2,417,920	2,423,856
Feb.	10,161,093	2,132,013	2,127,260
Mar.	10,129,854	2,474,821	2,544,480
Apr.	9,524,959	2,142,314	2,703,920
May	9,010,245	2,229,719	2,843,354

Source: The Rubber Manufacturers Association, Inc. Figures adjusted to represent 100% of the industry.

IMPROVED
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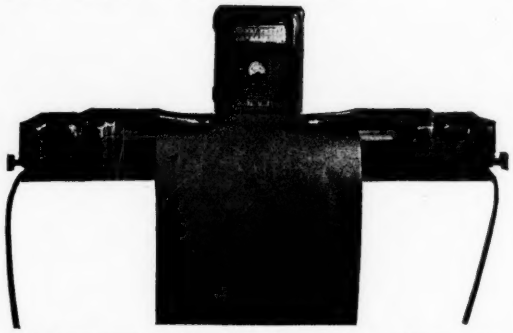
ARRANGED FOR CONTINUOUSLY GAUGING BOTH EDGES OF SHEET MATERIAL



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320 BROADWAY
NEW YORK

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	Apr. 30	May 28	June 4	June 11	June 18	June 25
May	8.75	....	....	....	....	....
June	8.76	7.89	8.03	8.11	....	....
July	8.78	7.92	8.06	8.14	8.41	8.75
Sept.	8.84	7.92	8.09	8.15	8.41	8.75
Dec.	8.86	7.94	8.14	8.22	8.48	8.83
Mar.	8.94	7.96	8.19	8.27	8.52	8.88
May	....	....	8.23	8.30	8.54	8.93

New York Quotations

June 24, 1938

Drills		
38-inch 2.00-yard	yd.	$0.10¾
40-inch 3.47-yard		.06½
50-inch 1.52-yard		.14½
52-inch 1.85-yard		.12
52-inch 1.90-yard		.11¼
52-inch 2.20-yard		.10¼
52-inch 2.50-yard		.09
59-inch 1.85-yard		.11
Ducks		
38-inch 2.00-yard D. F.	yd.	.10½/.10¾
40-inch 1.45-yard S. F.		.15
51¼-inch 1.35-yard D. F.		.15½
72-inch 1.05-yard D. F.		.21½/.22
72-inch 17.21-ounce		.23⅜
Mechanicals		
Hose and belting	lb.	.24
Tennis		
52-inch 1.35-yard	yd.	.16¾
Hollands		
Gold Seal and Eagle		
20-inch No. 72	yd.	.09
30-inch No. 72		.16
40-inch No. 72		.18
Red Seal and Cardinal		
20-inch	yd.	.07½
30-inch		.13¾
40-inch		.15
50-inch		.24
Osnaburgs		
40-inch 2.34-yard	yd.	.09⅜
40-inch 2.48-yard		.08¾
40-inch 2.56-yard		.08⅛
40-inch 3.00-yard		.07⅛
40-inch 7-ounce part waste		.06½
40-inch 10-ounce part waste		.09¾
37-inch 2.42-yard		.09¼
Raincoat Fabrics		
Cotton		
Bombazine 60 x 64	yd.	.07¼
Plaids 60 x 48		.09¾
Surface prints 60 x 64		.10¾
Print cloth, 38½-inch, 60 x 64		.04⅜
Sheetings, 40-inch		
48 x 48, 2.50-yard	yd.	.07
64 x 68, 3.15-yard		.06⅞
56 x 60, 3.60-yard		.05⅞
44 x 40, 4.25-yard		.04½
Sheetings, 36-inch		
48 x 48, 5.00-yard	yd.	.04
44 x 40, 6.15-yard		.03⅜
Tire Fabrics		
Builder		
17¼ ounce 60" 23/11 ply Karded peeler	lb.	.29½
Chafer		
14 ounce 60" 20/8 ply Karded peeler	lb.	.29½
9¼ ounce 60" 10/2 ply Karded peeler	lb.	.28½
Cord Fabrics		
23/5/3 Karded peeler, 1 1/16" cotton	lb.	.30½
15/3/3 Karded peeler, 1 1/16" cotton	lb.	.28½
23/5/3 Karded peeler, 1¼" cotton	lb.	.36
23/5/3 Combed Egyptian	lb.	.49½
Leno Breaker		
8¼ ounce and 10¼ ounce 60" Karded peeler	lb.	.31½

THE accompanying table of week-end closing prices on the New York Cotton Exchange shows the week-end change of representative futures covering the past two months.

The New York spot middling price closed at 7.71¢ per pound on May 31, the lowest level in history in terms of the old gold dollar. The price during the second and third weeks of June was influenced by continued rains in the cotton belt and by an increasing number of reports of weevil damage; the closing price on June 21 was 8.71¢. On June 29, the closing price was 8.85¢ per pound.

Sales at 13 southern markets during 17 days since May 31 totaled 35,978 bales, as compared with 24,418 bales during the same days one year ago.

The Census Bureau reported that consumption of all cotton in domestic mills totaled 425,684 bales during May, against 414,392 in April and 669,665 during May, 1937.

The Commodity Credit Corp. announced that cotton loans disbursed by the corporation and other lending agencies through June 16 totaled $235,683,852, covering 5,395,842 bales.

Fabrics

Activity in the fabrics markets has shown a gradual improvement during the past month; a more pronounced demand took effect during the latter part of June, following the upturn in the securities and other commodity markets. It is anticipated that with increasing interest by large users, the market will become firmer in regard to price. With the exception of tire fabrics and hollands, slight price reductions were registered in all groups.

RECLAIMED RUBBER

United States Reclaimed Rubber Statistics—Long Tons

Year	Production	Consumption†	Consumption % to Crude	U. S. Stocks*	Exports
1936	150,571	141,486	24.6	19,000	7,085
1937	185,033	162,000	29.8	28,800	13,233
1938					
Jan.	7,698	6,940	23.6	28,900	658
Feb.	6,198	7,141	29.9	27,487	470
Mar.	6,875	8,471	27.8	25,432	459
Apr.	6,399	7,480	26.7	23,339	426
May	6,866	8,009	27.7	22,275	...

*Stocks on hand the last of the month or year. †Corrected to 100% from estimate of reported coverage.
Compiled by The Rubber Manufacturers Association, Inc.

ACCORDING to R.M.A. figures, May reclaimed rubber consumption is estimated at 8,009 long tons, an increase of 7% over the April figure; production, 6,866 long tons; and stocks on hand May 31, 22,275 long tons. With production running slightly under consumption during the past few months, stocks have been decreasing steadily. The demand for reclaim during the past month showed a slight improvement over May. There have been recent indications of a somewhat improved sentiment from buying interests.

The market is easier with all grades except mechanical blends lower.

Rubber Trade Inquiries

The inquiries that follow have already been answered; nevertheless they are of interest not only in showing the needs of the trade, but because of the possibility that additional information may be furnished by those who read them. The Editor is therefore glad to have those interested communicate with him.

No.	INQUIRY
2478	Manufacturer of "Texoline."
2479	Manufacturer of rubber clicker blocks used in the shoe industry.
2480	Manufacturer of a machine to buff the outside of hose for a smooth finish.
2481	Manufacturer of oxygen bombs.
2482	Manufacturer of rubber fly swatter blades.
2483	Manufacturer of thin rubber sheeting.
2484	Manufacturer of molded ash trays in walnut finish four inches in diameter.
2485	Manufacturer of Duxkin.
2486	Supplier of English vermilion or red mercuric sulphide of mercury.
2487	Manufacturers of machinery for making cycle tires and tubes.
2488	Suppliers of rubber compounding ingredients.
2489	Wanted blue print showing layout of machinery, h.p. requirements, etc., for a cycle tire and tube plant.
2490	Manufacturer of air valves for cycle tubes.
2491	Supplier of liquid rubber called Bovel.
2492	Manufacturer of rubber coated wire or rubber wire for shelving in a chemical laboratory.
2493	Manufacturer of inflated rubber ring for deck tennis.
2494	Who regrinds calender rolls?

New York Quotations

June 29, 1938

	Sp. Grav.	¢ per lb.
Auto Tire		
Black Select	1.16-1.18	6 / 6¼
Acid	1.18-1.22	6¾/ 7
Shoe		
Standard	1.56-1.60	6½/ 6¾
Tubes		
No. 1 Floating	1.00 - 12	/12¼
Compound	1.10-1.20	8 / 8¾
Red Tube	1.15-1.30	8 / 8¼
Miscellaneous		
Mechanical Blends	1.25-1.50	4¼/ 5
White	1.35-1.50	11½/12

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

MOST FABRIC PROBLEMS CAN BE SOLVED THROUGH INTELLIGENT COOPERATION ON *Special Specifications*

WE WELCOME the opportunity of working with you on any fabric problem. Our engineers have been able to help materially in the development of special fabrics to meet particular requirements in the rubber industry.

In addition to the usual constructions of hose and belting ducks, sheetings, osnaburgs and aeronautical fabrics, regularly produced and supplied to the rubber industry by our 17 modern mills, we can offer you on special fabrics the complete facilities of one of the world's largest cotton textile organizations. These include up-to-the-minute laboratory and research facilities, modern production facilities and the technical experience of a staff of cotton textile engineers who have had long experience in cooperating with rubber engineers to develop cotton fabrics built to their special specifications.

WELLINGTON SEARS COMPANY

65 Worth Street, New York, N. Y.

BOSTON • CHICAGO • DETROIT • PHILADELPHIA • ATLANTA • ST. LOUIS • NEW ORLEANS • LOS ANGELES • SAN FRANCISCO

Rubber Goods Production Statistics

		1938 Mar.	1937 Mar.
TIRES AND TUBES			
Pneumatic casings:			
Production	thousands	2,759	5,916
Shipments, total	thousands	2,878	5,787
Domestic	thousands	*	5,687
Stocks, end of month	thousands	10,808	12,448
Inner Tubes:			
Production	thousands	2,444	5,823
Shipments, total	thousands	2,520	5,571
Domestic	thousands	*	5,499
Stocks, end of month	thousands	10,093	11,904
Raw material consumed:			
Fabrics	thous. of lbs.	....	26,542
MISCELLANEOUS PRODUCTS			
Single and double texture proofed fabrics:			
Production	thous. of yds.	3,089	5,255
Rubber and canvas footwear:			
Production, total	thous. of prs.	4,453	7,595
Tennis	thous. of prs.	*	4,269
Waterproof	thous. of prs.	*	3,327
Shipments, total	thous. of prs.	4,197	5,439
Tennis	thous. of prs.	*	4,361
Waterproof	thous. of prs.	*	1,078
Shipments, domestic, total	thous. of prs.	*	5,377
Tennis	thous. of prs.	*	4,309
Waterproof	thous. of prs.	*	1,068
Stocks, total, end of month	thous. of prs.	20,558	16,998
Tennis	thous. of prs.	*	4,945
Waterproof	thous. of prs.	*	12,053

*Data no longer available.

The above figures have been adjusted to represent 100% of the industry based on reports received which represented 81% for 1936-37.

Source: *Survey of Current Business*, Bureau of Foreign & Domestic Commerce, Washington, D. C.

Foreign Trade Information

For further information concerning the inquiries listed below address United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Room 734, Custom House, New York, N. Y.

No.	COMMODITY	CITY AND COUNTRY
*6461	Automobile and motorcycle accessories.	Paris, France
†6467	Storage batteries for motor vehicles...	Rangoon, Burma
‡6476	Rubber goods	Port Louis, Mauritius
‡6506	Rubber heels and soles	Manila, P. I.
‡6516	Crude rubber and cord fabric for tires.	Mexico City, Mexico
‡6518	Transmission belting	Mexico City, Mexico
‡6523	Office supplies	Athens, Greece
*6524	Sporting goods	Paris, France
‡6535	Cord fabric for tires	Rio de Janeiro, Brazil
†6573	Lithopone, zinc oxide and pigments...	Buenos Aires, Argentina
*6579	Telephone cable	Mecca, Arabia
‡6599	Electric cords	Barranquilla, Colombia
‡6629	Elastic garters and braces and waterproof clothing	Johannesburg, South Africa
‡6630	Rubberized fabric	The Hague, Netherlands
†6638	Bicycle tires and tubes	Mombasa, East Africa
‡6661	Carbon black	Oslo, Norway
‡6675	Combs	Santiago, Chile
‡6685	Baby pants and rubber bathing caps and suits	Istanbul, Turkey
‡6687	Rubber and composition shoes	Durres, Albania
‡6699	Fountain pens	Beirut, Syria
*6718	Tire air pressure gage	Prague, Czechoslovakia
*6730	Carbon black	The Hague, Netherlands
*6757	Club bags	Edmonton, Canada
†6760	Automobile and truck tires	Havre, France
‡6762	Toys	Boksburg North, South Africa
*6780	Rubber and balata belting	Brno, Czechoslovakia
*6790	Denture materials	Paris, France
*6801	Carbon black and sulphur	Brussels, Belgium

*Purchase. †Purchase and agency. ‡Agency.

Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

		March, 1938 Quantity	March, 1938 Value	Twelve Months Ended March, 1938 Quantity	Twelve Months Ended March, 1938 Value
UNMANUFACTURED					
Crude rubber, etc.	lb.	4,756,505	$683,685	78,780,215	$14,722,433
Gutta percha	lb.	1,338	239	11,626	6,583
Rubber, recovered	lb.	903,800	48,196	12,870,100	640,215
Rubber, powdered, and gutta percha scrap	lb.	361,900	11,987	3,832,900	86,232
Balata	lb.	230	94	22,258	7,236
Rubber substitute	lb.	16,100	2,940	377,500	86,809
Totals		6,039,873	$747,141	95,894,599	$15,549,508
PARTLY MANUFACTURED					
Hard rubber comb blanks		.....	$734	.....	$6,108
Hard rubber, n. o. s.	lb.	4,343	2,878	62,454	40,723
Rubber thread not covered	lb.	2,504	2,271	47,546	36,286
Totals		6,847	$5,883	110,000	$83,117
MANUFACTURED					
Bathing shoes	pairs	31,452	$5,739	63,713	$13,355
Belting		.....	10,026	.....	110,962
Hose		.....	9,945	.....	101,446
Packing		.....	6,588	.....	72,201
Boots and shoes	pairs	16,094	7,625	96,352	92,411
Canvas shoes with rubber soles	pairs	6,361	1,928	134,238	38,269
Clothing, including waterproof		.....	6,123	.....	41,420
Raincoats	number	5,721	18,303	13,995	48,226
Gloves	dozen pairs	497	1,319	4,602	12,293
Hot water bottles		.....	858	.....	26,227
Liquid rubber compound		.....	.....	.....	47,649
Tires, bicycle	number	18,730	8,477	126,766	57,558
Pneumatic	number	1,526	19,455	24,516	272,769
Inner tubes	number	702	1,054	6,462	12,547
Solid for automobiles and motor trucks	number	34	2,063	571	24,959
Other solid tires		.....	1,254	.....	18,793
Mats and matting		.....	4,602	.....	53,893
Cement		.....	7,563	.....	83,469
Golf balls	dozens	2,811	5,387	33,961	75,300
Heels	pairs	2,399	155	151,826	5,213
Other rubber manufactures		.....	122,343	.....	1,603,701
Totals		.....	$240,807	.....	$2,812,661
Totals, rubber imports		.....	$993,831	.....	$18,445,286

Exports of Domestic and Foreign Rubber Goods

	Produce of Canada Value	Reexports of Foreign Goods Value	Produce of Canada Value	Reexports of Foreign Goods Value
UNMANUFACTURED				
Waste rubber	$4,272	.....	$135,993	.....
MANUFACTURED				
Belting	$68,757	.....	$837,828	.....
Canvas shoes with rubber soles	144,423	.....	912,328	.....
Boots and shoes	214,116	.....	4,452,641	.....
Clothing, including waterproofed	33,133	.....	387,670	.....
Heels	12,298	.....	186,437	.....
Hose	22,635	.....	224,611	.....
Soles	17,681	.....	207,512	.....
Tires, pneumatic	702,836	.....	8,200,619	.....
Not otherwise provided for	.....	.....	120	.....
Inner tubes	70,003	.....	738,777	.....
Other rubber manufactures	71,090	$1,575	804,141	$53,329
Totals	$1,356,972	$1,575	$16,952,684	$53,329
Totals, rubber exports	$1,361,244	$1,757	$17,088,677	$53,329

Dividends Declared

Company	Stock	Rate	Payable	Stock on Record
American Hard Rubber Co.	8% Pfd.	$2.00 q.	June 30	June 10
Dewey & Almy Chemical Co.	$7 Pr. Pfd.	$1.75 q.	June 15	June 10
Dewey & Almy Chemical Co.	$7 Pfd., B	$1.75 q.	June 15	June 10
Faultless Rubber Co.	Com.	$0.25, reduced	July 1	June 15
Firestone Tire & Rubber Co.	Com.	$0.25	July 20	July 5
Garlock Packing Co.	Com.	$0.25 q.	June 30	June 18
General Electric Co.	Com.	$0.20, reduced	July 25	June 24
General Tire & Rubber Co.	Pfd.	$1.50 q.	June 30	June 20
Goodyear Tire & Rubber Co.	Pfd.	$0.625 q.	July 2	June 15
Goodyear Tire & Rubber Co. of Canada, Ltd.	Com.	$0.63 q.	July 2	June 15
Jenkins Bros.	Pfd.	$1.75 q.	June 30	June 23
I. B. Kleinert Rubber Co.	Com.	$0.10	June 30	June 15
Midwest Rubber Reclaiming Co.	Com.	$0.25	June 25	June 15
Pahang Rubber, Ltd.	Com.	$0.10	June 25	June 17

United States Latex Imports

Year	Lbs. Solids	Value
1936	44,469,504	$6,659,899
1937	51,934,040	10,213,670
1938		
Jan.	3,135,524	494,242
Feb.	3,772,897	560,883
Mar.	2,192,459	327,844
Apr.	1,991,943	295,690
May	1,968,576	279,502

Data from Leather and Rubber Division, United States Department of Commerce, Washington, D. C.

COMPOUNDING INGREDIENTS

BUSINESS in general continued dull in the compounding materials markets during June, and no marked improvement is anticipated before the fall. Lithopone, leaded zinc oxides, and titanium pigments declined in price; litharge advanced; while other materials remain at former levels.

CARBON BLACK. The demand for carbon black remained quiet during the past month, and producers anticipate no increase in activity until the fall. Prices have not been changed.

FACTICE OR RUBBER SUBSTITUTE. Little change has occurred in demand for rubber substitute. Indications are that prices will move slightly lower in July.

LITHARGE. In company with other lead oxides, the demand for litharge was light during June. In company with the advance in metallic lead, litharge prices rose ½¢ per pound during June.

LITHOPONE. Prices of lithopone were lowered ¼¢ per pound during the past month. The drop affected ordinary strength, high-strength, and titanated lithopones.

RUBBER CHEMICALS. The demand for rubber chemicals still continues very moderate, with no change expected for some time. Prices are generally unchanged.

RUBBER SOLVENTS. The demands of the tire industry did not show any improvement during the past month. Prices continue unchanged.

STEARIC ACID. The market has been generally quiet, with some business from makers of soaps and candles. Selling schedules remain at previous levels.

TITANIUM PIGMENTS. With production of light and white tinted rubber compounds far below the corresponding levels for 1937, there has been little activity in titanium pigments in connection with the rubber market. The price of titanium dioxide was reduced 1¢ per pound to 15¢ per pound (carloads); the barium, calcium, and magnesium pigments were lowered ¼¢ per pound to 5½¢ per pound (carloads). Barrel prices are ¼¢ per pound higher than the aforementioned prices which are for bag packing. It is anticipated that these prices will hold for the remainder of the year.

ZINC OXIDE. Demand for zinc oxides continued light during the past month. Lead-free oxide prices continue unchanged, but the prices of high lead strength oxides were lowered; 35% leaded zinc oxide was reduced 1/10¢ per pound, and the 50% leaded grade was lowered 1/5¢ per pound. There was no change in the price of 5% leaded oxide.

New York Quotations

June 24, 1938

Prices Not Reported Will Be Supplied on Application

Abrasives			
Pumicestone, powdered	lb.	$0.03	/$0.035
Rottenstone, domestic	lb.	.03	/ .035
Silica, 15	ton	38.00	
Accelerators, Inorganic			
Lime, hydrated, l.c.l., New York	ton	20.00	
Litharge (commercial)	lb.	.065	/ .0725
Accelerators, Organic			
A-1	lb.	.26	
A-5-10	lb.	.35	/ .40
A-7	lb.	.42	/ .55
A-10	lb.	.35	/ .40
A-11	lb.	.52	/ .65
A-19	lb.	.52	/ .65
A-32	lb.	.70	/ .80
A-77	lb.	.42	/ .55
A-100	lb.	.42	/ .55
A-100-F-50	lb.	.25	/ .35
A-433	lb.	.45	/ .55
Accelerator 49	lb.	.42	
737	lb.	.43	/ .98
737-50	lb.	.26	/ 1.03
808	lb.	.70	/ .72
833	lb.	1.15	
Acrin	lb.	.55	
Aldehyde ammonia	lb.	.65	/ .70
Altax	lb.	.55	/ .65
B-J-F	lb.	.50	/ .55
Beutene	lb.	.70	/ .75
Butyl Zimate	lb.	3.00	
C-P-B	lb.	2.00	
Captax	lb.	.50	/ .60
Crylene	lb.	.40	/ .47
Paste	lb.	.30	/ .36
D-B-A	lb.	2.00	
Di-Esterex	lb.	.60	/ .70
Di-Esterex-N	lb.	.60	/ .70
Di-ortho-tolylguanidine	lb.	.46	/ 1.10
Diphenylguanidine	lb.	.36	/ 1.13
DOTG	lb.	.47	
DPG	lb.	.35	/ .45
El-Sixty	lb.	.50	/ .65
Ethylideneaniline	lb.	.42	/ .43
Ethyl Zimate	lb.	3.00	
Formaldehyde P.A.C.	lb.	.04½/	.06¼
Formaldehydeaniline	lb.	.31	
Formaldehyde-para-toluidine	lb.	.52	/ .54
Guantal	lb.	.40	/ .50
Hepteen	lb.	.35	/ .40
Base	lb.	1.35	/ 1.50
Hexamethylenetetramine U.S.P.	lb.	.46	
Technical	lb.	.47	
Lead oleate, No. 999	lb.	.12	
Witco	lb.	.15	
Monex	lb.	3.00	
Novex	lb.		
O. N. V.	lb.	1.00	/ 1.10
O-X-A-F	lb.	.50	/ .55
Ovac	lb.	.50	/ .55
Para-nitroso-dimethylaniline	lb.	.85	
Pentex	lb.	01'1	/ 00'1
Pip-Pip	lb.	$2.50	
Pipsolene	lb.	1.55	/$1.85
R-2	lb.	1.40	/ 1.80
Base	lb.	3.65	
R-23	lb.	.40	
R & H 50-D	lb.	.42	/ .43
Rotax	lb.	.60	/ .65
Safex	lb.	1.20	/ 1.30
Santocure	lb.	1.05	/ 1.30
Super-sulphur No. 1	lb.	.50	
No. 2	lb.	.20	/ .22
Tetrone A	lb.	3.00	
Thiocarbanilide	lb.	.24	/ .30
Thionex	lb.	3.00	
Trimene	lb.	.55	/ .65
Base	lb.	1.05	/ 1.20
Triphenyl guanidine (TPG)	lb.	.60	
Tuads	lb.	3.00	
Ureka	lb.	.60	/ .75
Blend B.	lb.	.60	/ .75
C	lb.	.56	/ .65
Vulcanex	lb.	.42	/ .43
Vulcanol	lb.	.85	
Z-B-X	lb.	2.50	
Z-88	lb.	.44	/ .60
Z-88-P	lb.	.51	
Zenite	lb.	.46	/ .48
A	lb.	.53	/ .55
B	lb.	.46	/ .48
Zimate	lb.	3.00	
Activator			
Barak	lb.	.50	
Age Resisters			
AgeRite Alba	lb.	1.50	/ 2.10
Exel	lb.	1.00	/ 1.02
Gel	lb.	.57	/ .77
Hipar	lb.	.65	/ .67
HP	lb.		
Powder	lb.	.52	/ .54
Resin	lb.	.52	/ .73
D	lb.	.52	/ .73
Syrup	lb.		
White	lb.	1.25	/ 1.75
Albasan	lb.	.70	/ .75
Aminox	lb.	.52	/ .61
Antox	lb.	.56	
B-L-E	lb.	.52	/ .61
Powder	lb.	.65	/ .74
B-X-A	lb.	.55	/ .61
Copper Inhibitor X-872	lb.	1.15	
Flectol B	lb.	.52	/ .65
H	lb.	.52	/ .65
White	lb.	.90	/ 1.15
M-U-F	lb.	1.50	
Neozone (standard)	lb.	.63	
A	lb.	.52	/ .54
B	lb.	.63	/ 1.02
C	lb.	.52	/ .54
D	lb.	.52	/ .54
E	lb.	.63	
Oxynone	lb.	.64	/ .80
Parazone	lb.	.68	
Perflectol	lb.	.65	/ .75
Permalux	lb.	1.20	
Santoflex A	lb.	$0.65	/$0.75
B	lb.	.52	/ .65
Santowhite	lb.	.95	/ 1.20
Solux	lb.	1.30	
Thermoflex A	lb.	.67	
V-G-B	lb.	.52	/ .61
Alkalies			
Caustic soda, flake, Columbia (400 lb. drums).100 lbs.		2.70	/ 3.55
liquid, 50%.100 lbs.		1.95	
solid (700 lb. drums).100 lbs.		2.30	/ 3.15
Antiscorch Materials			
A-F-B	lb.	.35	/ .40
Antiscorch T	lb.	.90	
Cumar RH	lb.	.09	
R-17 Resin (drums)	lb.	.10	
RM	lb.	1.25	
Retarder W	lb.	.36	
U.T.B.	lb.	.35	/ .40
Antisun Materials			
Heliozone	lb.	.27	
Sunproof	lb.	.27	/ .30
Brake Lining Saturant			
B. R. T. No. 3	lb.	.0165/	.0175
Colors			
BLACK			
Du Pont powder	lb.	.42	/ .44
Lampblack (commercial)	lb.	.15	
BLUE			
Brilliant	lb.		
Du Pont dispersed	lb.	.70	/ 3.60
Powders	lb	.45	/ 3.75
Prussian	lb.	.0375	
Toners	lb.	.08	/ 3.85
BROWN			
Mapico	lb.	.11	
GREEN			
Brilliant	lb.		
Chrome, light	lb.		
medium	lb.	.22	
oxide (freight allowed)	lb.		
Dark	lb.		
Du Pont dispersed	lb.	.87	/ 1.60
Powders	lb.	1.00	/ 2.00
Guignet's, Easton, Pa., bbls.	lb.	.70	
Light	lb.		
Toners	lb.	.85	/ 3.75
ORANGE			
Du Pont dispersed	lb.	.80	/ .90
Powders	lb.	.80	/ 2.50
Lake	lb.		
Toners	lb.	.40	/ 1.60
ORCHID			
Toners	lb.	1.50	/ 2.00
PINK			
Toners	lb.	1.50	/ 4.15
PURPLE			
Permanent	lb.		
Toners	lb.	.60	/ 2.10

RED

Antimony		
Crimson, 15/17%	lb.	$0.45
R. M. P. No. 3	lb.	.48
Sulphur free	lb.	.50
R.M.P.	lb.	.52
Golden 15/17%	lb.	.28
7-A	lb.	.37
Z-2	lb.	.23
Aristi	lb.	1.75
Cadmium, light (400 lb. bbls.	lb.	.70 /$0.75
Chinese	lb.	
Crimson	lb.	
Du Pont dispersed	lb.	.85 / 2.05
Powders	lb.	.30 / 1.40
Mapico	lb.	.0925
Medium	lb.	
Rub-Er-Red, Easton, Pa., bbls.	lb.	.0925
Scarlet	lb.	
Toners	lb.	.08 / 2.00

WHITE

Lithopone (bags)	lb.	.04⅛/ .04⅜
Albalith Black Label-11	lb.	.04⅛/ .04⅜
Astrolith	lb.	.04⅛/ .04⅜
Azolith	lb.	.04⅛/ .04⅜
Cryptone-19	lb.	.05⅜/ .05⅞
CB-21	lb.	.05⅜/ .05⅞
ZS No. 20	lb.	.08⅜/ .08⅝
No. 86	lb.	.08⅜/ .08⅝
No. 230	lb.	.08⅜/ .08⅝
Sunolith	lb.	.04⅛/ .04⅜
Ray-Bar	lb.	.05⅞/ .06⅛
Ray-Cal	lb.	.05⅞/ .06⅛
Rayox	lb.	.16 / .19
Titanolith (5-ton lots)	lb.	.05⅜/ .05⅞
Titanox-A (50-lb. bags)	lb.	.16 / .1675
B (50-lb. bags)	lb.	.05⅞/ .06⅛
B-30 (50-lb. bags)	lb.	.05⅞/ .06⅛
C (50-lb. bags)	lb.	.05⅞/ .06⅛
Ti-Tone	lb.	
Zinc Oxide		
Anaconda, Green Seal No. 333	lb.	.08 / .085
Lead Free No. 109	lb.	.0625/ .0675
No. 116	lb.	.0625/ .0675
No. 352	lb.	.075 / .08
No. 570	lb.	.075 / .08
No. 577	lb.	.075 / .08
Red Seal No. 222	lb.	.075 / .08
U.S.P. No. 777 (bbls.)	lb.	.095 / .0975
White Seal No. 555	lb.	.085 / .09
Azo ZZZ-11	lb.	.0625/ .065
44	lb.	.0625/ .065
55	lb.	.0625/ .065
66	lb.	.0625/ .065
French Process, Florence		
White Seal-7 (bbls.)	lb.	.085 / .0875
Green Seal-8	lb.	.08 / .0825
Red Seal-9	lb.	.075 / .0775
Kadox, Black Label-15	lb.	.065 / .0675
No. 25	lb.	.075 / .0775
Red Label-17	lb.	.065 / .0675
Horse Head Special 3	lb.	.0625/ .065
XX Red-4	lb.	.0625/ .065
23	lb.	.0625/ .065
72	lb.	.0625/ .065
78	lb.	.0625/ .065
80	lb.	.0625/ .065
103	lb.	.0625/ .065
110	lb.	.0625/ .065
St. Joe (lead free)		
Black Label	lb.	.0625/ .065
Green Label	lb.	.0625/ .065
Red Label	lb.	.0625/ .065
U.S.P.	lb.	.095 / .0975
White Jack	lb.	.08⅜/ .08⅝
Zopaque (bags)	lb.	.15 / .1575

YELLOW

Cadmolith (cadmium yellow), 400 lb. bbls.	lb.	.45 / .50
Du Pont dispersed	lb.	1.25 / 1.60
Powders	lb.	.70 / 1.37
Lemon	lb.	
Mapico	lb.	.0675
Toners	lb.	2.50

Dispersing Agents

Bardol	lb.	.0215/ .024
Darvan	lb.	.30 / .50
Nevoll (drums)	lb.	.0215
Santomerse S	lb.	.11 / .25

Fillers, Inert

Asbestine, c.l., f.o.b., mills	ton	15.00
Barytes	ton	30.00 /36.00
f.o.b., St. Louis (50 lb. paper bags)	ton	22.85
off color, domestic	ton	20.00 /25.00
white, imported	ton	29.00 /32.00
Blanc fixe, dry, precip.	lb.	.03 / .035
Calcene	ton	37.50 /45.00
Infusorial earth	lb.	.02 / .03
Kalite No. 1	ton	24.00 /50.00
No. 3	ton	34.00 /60.00
Magnesia, calcined, heavy	lb.	.04
Carbonate, l.c.l.	lb.	.07 / .095
Pyrax A	ton	7.50 /20.00
Whiting		
Columbia Filler	ton	9.00 /14.00
Guilders	100 lbs.	
Hakuenka	lb.	
Paris white, English cliff-stone	100 lbs.	
Southwark Brand, Commercial	100 lbs.	
All other grades	100 lbs.	
Suprex, white extra light	ton	$45.00 /$60.00
heavy	ton	45.40 /60.00
Witco, c.l.	ton	7.00

Finishes

IVCO lacquer, clear	gal.	1.55 / 2.55
colors	gal.	2.60 / 3.25
Rubber lacquer, clear	gal.	
colored	gal.	
Starch, corn, pwd.	100 lbs.	
potato	lb.	
Talc	ton	25.00 /45.00

Flock

Cotton flock, dark	lb.	.12 / .13
dyed	lb.	.50 / .85
white	lb.	.145 / .20
Rayon flock, colored	lb.	1.25 / 2.00
white	lb.	1.00 / 1.25

Latex Compounding Ingredients

Accelerator 85	lb.	.35
89	lb.	1.40
122	lb.	1.55
552	lb.	2.50
Aerosol	lb.	.45
Antox, Dispersed	lb.	.42
Aquarex A	lb.	.35
D	lb.	.75
F	lb.	.85
Areskap No. 50	lb.	.18 / .24
No. 100, dry	lb.	.39 / .51
Aresket No. 240	lb.	.16 / .22
No. 300, dry	lb.	.42 / .50
Aresklene No. 375	lb.	.35 / .50
No. 400, dry	lb.	.51 / .65
Black No. 25, Dispersed	lb.	.22 / .40
Catalpo	ton	
Color Pastes, dispersed	lb.	.35 / 1.75
Dispersex No. 15	lb.	.11 / .12
No. 20	lb.	.08 / .10
Emo, brown	lb.	.15
white	lb.	.15
Factice Compound, Dispersed	lb.	.36
Heliozone, Dispersed	lb.	.25
Igepon A	lb.	
MICRONEX, Colloidal	lb.	.055 / .07
Nekal BX (dry)	lb.	
Palmol	lb.	.10
Pipsol X	lb.	3.05 / 3.55
R-23	lb.	.57
RN-2	lb.	1.40 / 1.80
S.1 (400 lb. drums)	lb.	.65
Santomerse S	lb.	.11 / .25
D	lb.	.41 / .65
Santovar A	lb.	1.15 / 1.40
Stablex A	lb.	.90 / 1.10
B	lb.	.65 / .90
C	lb.	.40 / .50
Sulphur, Dispersed	lb.	.10 / .15
No. 2	lb.	.075 / .15
T.1. (400 lb. drums)	lb.	.40
Tepidone	lb.	1.75
Vulcan Colors	lb.	
Zinc oxide, dispersed	lb.	.12 / .15

Mineral Rubber

B. R. C. No. 20	lb.	.009 / .01
Black Diamond	ton	25.00
Genasco Hydrocarbon, granulated, (fact'y)	ton	
solid	ton	
Gilsonite Hydrocarbon (factory)	ton	
Hydrocarbon, hard	ton	22.00 /42.00
Parmr Grade 1	ton	25.00 /27.00
Grade 2	ton	25.00 /27.00
Pioneer	ton	
285°-300°	lb.	22.00 /42.00

Mold Lubricants

Lubrex	lb.	.25 / .30
Mold Paste	lb.	.12 / .18
Sericite	ton	65.00 /75.00
Soapbark	lb.	
Soapstone	ton	25.00 /35.00

Oil Resistant

AXF	lb.	.40 / .45

Reclaiming Oils

B. R. V.	lb.	.03 / .0325
S. R. O.	lb.	.0175/ .0185

Reenforcers

Carbon Black		
Aerfloted Arrow Specification Black	lb.	
Arrow Compact Granulized Carbon Black	lb.	
"Certified" Heavy Compressed, Cabot	lb.	
Spheron	lb.	
Continental Dustless, c.l.	lb.	.0275/ .0375
Compressed c.l.	lb.	.0275/ .0375
Uncompressed, c.l.	lb.	.0275/ .0375
Disperso, c.l.	lb.	.0275/ .0375
Dixie, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275
c.l., delivered New York.	lb.	.0375
local stock, bags, delivered	lb.	.0625
Dixiedensed, c.l., f.o.b., New Orleans, La., Galveston or Houston, Tex.	lb.	.0275
c.l., delivered New York.	lb.	.0375
local stock, bags, delivered	lb.	.0625
Carbon Black (*Cont'd*)		
Dixiedensed 66, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	$0.0275
c.l., delivered New York.	lb.	.0375
local stock, bags, delivered	lb.	.0625
Excello, c.l., f.o.b. Gulf ports	lb.	.0275/$0.0475
delivered New York	lb.	.0375/ .0575
l.c.l., delivered New York	lb.	.0625/ .07
Fumonex, c.l., f.o.b. works.	lb.	.03
ex-warehouse	lb.	.045
Gastex	lb.	.03 / .07
Kosmobile, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275
c.l., delivered New York.	lb.	.0375
local stock, bags, delivered	lb.	.0625
Kosmobile 66, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275
c.l., delivered New York.	lb.	.0375
local stock, bags, delivered	lb.	.0625
Kosmos, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex.	lb.	.0275
c.l., delivered New York.	lb.	.0375
local stock, bags, delivered	lb.	.0625
MICRONEX Beads, c.l., f.o.b. Gulf ports	lb.	.0275
c.l., delivered, New York	lb.	.0375
local stock, bags, delivered	lb.	.0625
Mark II, c.l., f.o.b. Gulf ports	lb.	.0275
c.l., delivered, New York	lb.	.0375
local stock, bags, delivered	lb.	.0625
Standard, c.l., f.o.b. Gulf ports	lb.	.0275
c.l., delivered, New York	lb.	.0375
local stock, bags, delivered	lb.	.0625
W-5, c.l., f.o.b., Gulf ports	lb.	.0275
c.l., delivered, New York	lb.	.0375
local stock, bags, delivered	lb.	.0625
W-6, c.l., f.o.b., Gulf ports	lb.	.0275
c.l., delivered, New York	lb.	.0375
local stock, bags, delivered	lb.	.0625
Paradene No. 2 (drums)	lb.	.04
Pelletex	lb.	.03 / .07
Supreme, c.l., f.o.b. Gulf ports	lb.	.0275/ .0475
delivered New York	lb.	.0375/ .0575
l.c.l. delivered New York	lb.	.0625/ .07
"WYEX BLACK"	lb.	
Carbonex (bags)	lb.	.029 / .0315
"S" (bags)	lb.	.0315/ .034
Clays		
Aerfloted Paragon (50 lb. bags)	ton	9.50
Suprex (50 lb. bags)	ton	9.50
China	ton	17.50 /20.00
Dixie	ton	11.00 /30.00
Junior	ton	9.50 /29.00
McNamee	ton	9.50 /22.00
Par	ton	9.50 /22.00
Witco, f.o.b. Works	ton	9.50
Cumar EX	lb.	.035
P-33	lb.	.0475/ .0775
Thermax	lb.	.0175/ .05
Velvetex	lb.	.03 / .045

Reordorants

Amora A	lb.	
B	lb.	
C	lb.	
D	lb.	
Curodex 19	lb.	2.75
188	lb.	3.50
198	lb.	4.50
Rodo No. 0	lb.	3.50 / 4.00
No. 10	lb.	4.50 / 5.00

Rubber Substitutes

Black	lb.	.07 / .135
Brown	lb.	.085 / .14
White	lb.	.085 / .145
Factice		
Amberex	lb.	.19
Brown	lb.	.07 / .12
Neophax A	lb.	.105
B	lb.	.105
Fac-Cel B	lb.	.15
C	lb.	.15
White	lb.	.08 / .13

(*Continued on page* 82)

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)

Allow nine words for keyed address. *Replies forwarded without charge.*

SITUATIONS WANTED

CHEMIST. SEVEN YEARS' EXPERIENCE ON FOOTWEAR, coated fabrics, cements for automotive industry, latex dipping, sponge and spreading, asphalts and synthetics. Exceptional background and references. Address Box No. 976, care of INDIA RUBBER WORLD.

RESEARCH COMPOUNDER, AGE 37, ELEVEN YEARS' EXperience with large tire company. Three years' experience with large proofing company. Excellent references. Address Box No. 978, care of INDIA RUBBER WORLD.

SUPERINTENDENT, CHEMIST, DEVELOPMENT ENGINEER, PRODuction manager desires change. Competent to compound for mechanical rubber goods and synthetic rubber or sponge rubber products. Capable of estimating factory costs and drawing up manufacturing specifications. Eighteen years' active experience. University education. Age 39, Address Box No. 980, care of INDIA RUBBER WORLD.

RUBBER TECHNOLOGIST, GRADUATE CHEMIST with twelve years' experience, chiefly soft and hard rubber mechanicals and dipped goods. Familiar with modern compounding practice and production methods. Consider position as superintendent of small, well-financed plant. Location immaterial. Employed. Address Box No. 981, care of INDIA RUBBER WORLD.

SALES EXECUTIVE, AGE 37, TEN YEARS' EXPERIence sundry, mechanical, sponge rubber, and wide variety of molded products. Thorough knowledge modern manufacturing methods—can develop items. Excellent selling connections, particularly New York Market, all classes of trade. Desires position with reputable manufacturer or will handle lines commission basis. Address Box No. 982, care of INDIA RUBBER WORLD.

CHEMIST-ENGINEER: EXPERIENCED IN THE DEVELOPMENT of newer types of coated textiles for furniture, shoe, and sportswear trade. Knowledge of lacquer, resin, and flocked fiber finishes. Address Box No. 984, care of INDIA RUBBER WORLD.

FOSTER D. SNELL, INC.
Chemists—Engineers
Every form of Chemical Service
305 Washington Street **Brooklyn, N. Y.**

EDWARD FOX
Latex Technologist • Research • Development
153 CENTRE STREET NEW YORK, N. Y.

CALENDER SHELLS
ANY DIAMETER, ANY LENGTH
The W. F. Gammeter Co., Cadiz, Ohio

CORONA GOLF BALL WINDING MACHINES
Used everywhere by manufacturers. Rented on a monthly basis in U. S. Sold outright in foreign countries.
Illustrated circular on request.
Corona Manufacturing Company
Mount Airy, Philadelphia, Pa., U. S. A.

Deresinated and Precipitated Surinam
BALATA
Refined approximately 99%
Purer and cheaper than you can produce it and you avoid the ever present fire risk. Dependable deliveries. Sample on request.
HUNTINGDON MANUFACTURING CO.
MEADOWBROOK, PA.

SITUATIONS OPEN

LATEX EXPERT FOR MAKING ARTIFICIAL LEATHER IN A spreading machine. With good knowledge of the manufacture of calendered sheet rubber for a firm in South America. Address Box No. 977, care of INDIA RUBBER WORLD.

SALESMAN WANTED, FOR A SMALL EASTERN RUBBER MANUfacturer. One who can secure a line of molded specialties from the jobbing trade in the New York area. Commission Basis. Address Box No. 983, care of INDIA RUBBER WORLD.

SALESMAN—MAN WITH FOLLOWING ON PRESS GOODS IN New York area, salary and commission basis. Address Box No. 985, care of INDIA RUBBER WORLD.

BUSINESS OPPORTUNITIES

AGENCIES WANTED FOR SALE IN EUROPE OF MINERAL OR chemical produces used in rubber trade. Address Box No. 975, care of INDIA RUBBER WORLD.

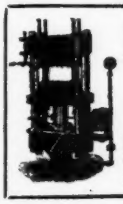
AGENTS WANTED BY RELIABLE SPECIALTY MOLDED RUBBER goods factory. Must have active sales representation and be able to produce live inquiries. Address Box No. 979, care of INDIA RUBBER WORLD.

Where Needs Are Filled
The Classified Ad. Columns of INDIA RUBBER WORLD bring prompt results at low cost.

INTERNATIONAL PULP CO.
41 Park Row, NEW YORK, N. Y.
SOLE PRODUCERS
ASBESTINE
REG. U. S. PAT. OFF.

TERKELSEN MACHINE COMPANY
Manufacturers of
SPIRAL WRAPPING MACHINES
for
COILS OF STEEL, WIRE AND HOSE
Write for Particulars
325 A Street **Boston, Mass.**

MECHANICAL
MOLDED RUBBER GOODS
Sponge Rubber: Sheeted—Die Cut—Molded
We Solicit Your Inquiries
THE BARR RUBBER PRODUCTS COMPANY
SANDUSKY, OHIO



PLASTICS MOLDING PRESSES
Plain or Semi-automatic—Any Size or pressure—Pumps, Valves, etc.
Dunning & Boschert Press Co., Inc.
336 W. WATER ST. **SYRACUSE, N. Y.**

(Advertisements continued on page 83)

New York Quotations

(*Continued from page 80*)

Softeners

Bondogen ..... lb.	$0.98	/$1.65
Burgundy pitch ..... lb.	.06	
Cycline oil ..... gal.	.14	/ .20
Nuba resinous pitch (drums)		
Grades No. 1 and No. 2. lb.	.03	
Grade No. 3 ..... lb.	.04	
Palm oil (Witco), c.i. ..... lb.	.0575	
Pine tar ..... gal.		
Plastogen ..... lb.	.0775/	.125
Plastone ..... lb.	.30 /	.35
R-19 Resin (drums) ..... lb.	.10	
R-21 Resin (drums) ..... lb.	.10	
Reogen ..... lb.	.115 /	.30
Rosin oil, compounded.... gal.	.40	
RPA No. 1..... lb.	.65	
No. 2 ..... lb.	.65	
Rubtack ..... lb.	.10	
Tackol ..... lb.	.085 /	.18
Tonox D ..... lb.	.75 /	.85
Witco No. 20 ..... gal.	.20	
X-1 Resinous oil (tank car). lb.	.01	

Softeners for Hard Rubber Compounding

Resin C Pitch 55° C. M.P.... lb.	.013 /	.014
Resin C Pitch 70° C. M.P.... lb.	.013 /	.014
Resin C Pitch 85° C. M.P.... lb.	.013 /	.014

Solvents

Beta-Trichlorethane ..... gal.	$0.17	
Carbon bisulphide ..... lb.		
tetrachloride ..... lb.		
Industrial 90% benzol (tank car) ..... gal.	.16	

Stabilizers for Cure

Laurex, ton lots ..... lb.	.13	/$0.15
Stearex B ..... lb.	.105 /	.115
Beads ..... lb.	.09 /	.10
Stearic acid, single pressed. lb.	.105 /	.115
Stearite ..... 100 lbs.	9.00	
Zinc stearate ..... lb.	.23	

Synthetic Rubber

Neoprene Type E..... lb.	.75	
G ..... lb.	.80	
H ..... lb.	.80	
M ..... lb.	.80	
Latex Type 50..... lb.	.35	
55 ..... lb.	.35	
56 ..... lb.	.35	
"Thiokol" A (f.o.b. Yardville) ..... lb.	.35	
Coating materials ..... gal.	2.50	/ 5.00
DX ..... lb.	.55	
Molding Powder ..... lb.	.50	/ .75

Tackifier

B. R. H. No. 2..... lb.	.015 /	.016

Varnish

Shoe ..... gal.	$1.45

Vulcanizing Ingredients

Sulphur		
Chloride, drums ..... lb.	.035	/$0.04
Rubber ..... 100 lbs.	2.65	
Telloy ..... lb.	2.00	
Vandex ..... lb.	2.00	
(See also Colors—Antimony)		

Waxes

Carnauba, No. 3 chalky.... lb.	.37½	
2 N.C. ..... lb.	.39½	
3 N.C. ..... lb.	.37½	
1 Yellow ..... lb.	.4575	
2 ..... lb.	.4425	
Montan, crude ..... lb.	.11	

U. S. Excise Tax Receipts, April, 1938

Treasury Department receipts[1] under the tire and inner tube excise tax for April, 1938, were 85% of the 1937 corresponding figures, leaving the total for four months 55% of the 1937 figures—casings 54.5%; inner tubes, 57.6%. Figures for May customarily show large increases over April, but such was not the case this year.

EXCISE TAX ON RUBBER TIRES—THOUSANDS OF DOLLARS

Year	April	May	Quarter Years 1st	2nd	3rd	4th	Total
1935.....	1,305.9	2,317.3	4,699.5	5,921.7	6,117.9	5,921.8	22,660.9
1936.....	1,830.9	2,227.3	6,154.3	8,238.4	9,951.0	7,493.7	30,837.4
1937.....	2,144.7	3,724.0	8,418.0	8,176.8	9,128.1	7,777.3	33,500.2
1938.....	1,821.8	1,496.3*	3,933.7	.....	.....	.....	.....

EXCISE TAX ON INNER TUBES—THOUSANDS OF DOLLARS

1935.....	336.2	567.6	1,124.3	1,417.5	1,428.7	1,471.3	5,441.8
1936.....	386.0	455.0	1,237.0	1,638.5	2,022.4	1,506.1	6,404.0
1937.....	419.0	735.1	1,661.3	1,589.6	1,803.5	1,533.2	6,587.6
1938.....	364.2	342.0*	891.2	.....	.....	.....	.....

[1] United States Department of Commerce, Leather and Rubber Division, Rubber News Letter, Circular 3677, May 31, 1938.
*Figures from the Bureau of Internal Revenue.

Rubber Manufacturing Employment and Pay Rolls

Index numbers released by the Department of Labor[1] for employment and pay rolls for the rubber manufacturing industry, as compared with all manufacturing industries, with percentage change from April, 1937, to April, 1938, follow:

	April, 1937	March, 1938	April, 1938	April to April Percentage Change
All Manufacturing Industries:				
Employment	102.1	81.7	79.6	—22.0
Pay Rolls	104.9	73.3	70.5	—32.8
Rubber Manufacturing Industry:				
Employment	96.7	72.9	72.7	—24.8
Pay Rolls	100.3	60.6	61.5	—38.7
Tires and Inner Tubes:				
Employment	81.4	63.5	63.1	—22.5
Pay Rolls	90.5	52.4	54.3	—40.0
Rubber Boots and Shoes:				
Employment	76.0	54.7	53.9	—29.1
Pay Rolls	68.2	40.3	38.1	—44.1
Other Rubber Goods:				
Employment	147.1	107.9	108.7	—26.1
Pay Rolls	150.8	98.3	98.5	—34.7

(Three-year average 1923-1925 equals 100.0)

[1] United States Department of Commerce, Leather and Rubber Division, Rubber News Letter, Circular 3677, May 31, 1938.

British Malaya

An official cable from Singapore to the Malayan Information Agency, Malaya House, 57 Trafalgar Sq., London, W.C.2, England, gives the following figures for May, 1938:

Rubber Exports: Ocean Shipments from Singapore, Penang, Malacca, and Port Swettenham

To	Sheet and Crepe Rubber Tons	Latex, Concentrated Latex, Revertex, and Other Forms of Latex Tons
United Kingdom	8,342	347
United States	11,219	267
Continent of Europe ..	12,800	288
British possessions	2,417	19
Japan	1,741	25
Other countries	777	3
Totals	37,296	949

Rubber Imports: Actual, by Land and Sea

From	Dry Rubber Tons	Wet Rubber (Dry Weight) Tons
Sumatra	3,302	167
Dutch Borneo	920	18
Java and other Dutch Islands	194	..
Sarawak	1,696	6
British Borneo	385	29
Burma	564	3
Siam	2,010	544
French Indo-China	220	169
Other countries	87	11
Totals	9,378	947

Book Review

(*Continued from page 70*)

duced in the body of the book, and in addition a statistical appendix is provided giving data for world net imports of crude rubber, areas under plantation rubber, exports of crude rubber, highest and lowest London prices, etc. There is also a fairly extensive bibliography.

Professor Schumacher in his foreword acknowledges the assistance of the Rockefeller Foundation and the work of Dr. F. M. Judd, of New York.

Shipments of Crude Rubber from Producing Countries

Year	Malaya including Brunei and Labuan	N.E.I.	Ceylon	India	Burma	North Borneo	Sarawak	Siam	French Indo-China	Philippines Total	Philippines and Oceania	Africa	South America	Mexican Guavule	Grand Total
1936	353,700	309,600	49,700	8,600	5,800	8,200	21,000	34,600	40,800	832,000	1,600*	6,100	14,700	1,200	855,600
1937	469,960	431,646	70,359	9,777	7,232	13,213	25,922	35,551	43,374	1,107,034	1,617	7,678	16,008	2,692	1,135,029
1938															
Jan.	30,998	26,468	5,222	841	538	1,307	3,485	2,897	6,088	77,844	138	824	938	538	80,282
Feb.	37,166	27,362	5,216	639	770	918	8	3,266	3,070	78,415	125	641	1,640	218	81,039
Mar.	33,567	31,268	3,834	532	703	853	1,564	2,837	3,213	78,371	159	968	1,883	150	81,531
Apr.	44,744	28,350	1,951	505	842	1,158	1,728	1,583	3,647	84,508	150*	800*	1,085	200*	86,743

*Estimated. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

Classified Advertisements

Continued

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United States Statistics

Imports for Consumption of Crude and Manufactured Rubber

	March, 1938		Three Months Ended March, 1938	
UNMANUFACTURED—*Free*	Quantity	Value	Quantity	Value
Liquid latex (solids)....*lb.*	2,192,459	$327,844	9,100,880	$1,382,969
Jelutong or pontianak....*lb.*	1,314,982	239,271	4,651,242	818,794
Balata ....*lb.*	154,226	19,454	279,034	39,805
Gutta percha ....*lb.*	54,051	9,504	305,533	48,188
Guayule ....*lb.*	337,000	41,518	2,029,400	249,300
Siak ....*lb.*	.....	.....	45,400	5,179
Scrap and reclaimed....*lb.*	454,494	7,296	1,060,063	17,212
Totals	4,507,212	$644,887	17,471,552	$2,561,447
Misc. rubbers (above), 1,000 *lbs.*	4,507	$644,887	17,471	$2,561,447
Crude rubber ....1,000 *lbs.*	93,167	13,494,654	279,901	41,705,815
Totals ....1,000 *lbs.*	97,674	$14,139,541	297,372	$44,267,262
Chicle, crude ....*lb.*	1,063,839	$346,039	3,417,978	$1,050,784
MANUFACTURED—*Dutiable*				
Rubber tires ....*no.*	1.571	$12,926	3,722	$16,868
Rubber boots, shoes, and overshoes ....*prs.*	4,309	945	14,177	2,200
Rubber soled footwear with fabric uppers ....*prs.*	44,195	12,756	173,168	47,140
Golf balls ....*no.*	104,664	9,764	220,092	18,670
Lawn tennis balls....*no.*	69,349	7,568	228,913	20,606
Other rubber balls ....*no.*	147,436	6,663	860,585	43,294
Other rubber toys....*lb.*	18,869	3,120	126,111	19,893
Hard rubber combs....*no.*	744	30	129,492	8,524
Other manufactures of hard rubber	.....	822	.....	4,671
Friction or insulating tape.*lb.*	21,325	1,140	36,575	2,021
Belts, hose, packing, and insulating material....	.....	10,127	.....	22,565
Druggists' sundries of soft rubber	.....	3,047	.....	21,407
Inflatable swimming belts, floats, etc ....*no.*	78,024	6,997	185,943	14,685
Other rubber and gutta percha manufactures....*lb.*	69,441	16,724	269,686	61,879
Totals	.....	$92,629	.....	$304,423

Exports of Foreign Merchandise

RUBBER AND MANUFACTURES				
Crude rubber ....*lb.*	1,447,309	$198,865	2,858,002	$427,135
Balata ....*lb.*	18,580	5,638	83,350	26,017
Other rubber, rubber substitutes and scrap....*lb.*	89,428	10,652	282,646	35,537
Rubber manufactures (including toys)	.....	2,105	.....	3,654
Totals	.....	$217,260	.....	$492,343

Exports of Domestic Merchandise

RUBBER AND MANUFACTURES				
Reclaimed ....*lb.*	1,023,142	$62,623	3,549,481	$207,986
Scrap ....*lb.*	6,210,254	95,710	14,751,914	249,290
Cements ....*gal.*	31,553	29,790	80,093	70,384
Rubberized automobile cloth, *sq. yd.*	42,722	17,321	81,931	35,976
Other rubberized piece goods and hospital sheeting..*sq. yd.*	267,247	102,903	601,830	239,773
Boots ....*prs.*	9,888	23,535	33,911	74,073
Shoes ....*prs.*	47,906	22,064	71,139	35,331
Canvas shoes with rubber soles ....*prs.*	68,656	38,784	107,253	71,638
Heels ....*doz. prs.*	48,645	27,037	100,552	50,056
Soling and top lift sheets..*lb.*	42,575	9,090	118,090	26,458
Gloves and mittens..*doz. prs.*	7,963	17,670	24,130	49,463
Water bottles and fountain syringes ....*no.*	23,320	7,302	50,216	16,412
Other druggists' sundries....	.....	52,515	.....	130,885
Gum rubber clothing....*doz.*	21,703	55,796	65,068	139,869
Balloons ....*gross*	46,284	29,546	101,035	69,038
Toys and balls	.....	9,617	.....	27,752
Bathing caps ....*doz.*	8,141	17,865	13,436	28,031
Bands ....*lb.*	20,984	8,588	65,513	26,162
Erasers ....*lb.*	27,574	16,215	83,103	47,514
Hard rubber goods				
Electrical battery boxes.*no.*	17,693	13,339	59,112	40,561
Other electrical ....*lb.*	41,549	8,874	121,657	26,770
Combs, finished....*doz.*	10,583	5,537	69,303	23,026
Other hard rubber goods..	.....	17,224	.....	52,458
Tires				
Truck and bus casings..*no.*	19,540	386,112	55,279	1,083,070
Other auto casings....*no.*	46,378	486,146	147,433	1,452,196
Tubes, auto ....*no.*	43,691	69,966	138,411	210,524
Other casings and tubes.*no.*	6,641	54,294	17,476	151,765
Solid tires for automobiles and motor trucks....*no.*	107	7,374	835	22,902
Other solid tires....*lb.*	27,732	5,837	142,963	24,549
Tire sundries and repair materials	.....	73,298	.....	176,927
Rubber and friction tape..*lb.*	48,196	15,036	189,401	51,544
Fan belts for automobiles.*lb.*	45,118	24,569	112,927	59,954
Other rubber and balata belts ....*lb.*	322,342	159,621	714,991	364,937
Garden hose ....*lb.*	48,119	9,921	154,011	30,438
Other hose and tubing....*lb.*	422,120	154,054	1,057,664	392,004
Packing ....*lb.*	83,149	37,949	267,507	129,999
Mats, matting, flooring, and tiling ....*lb.*	78,764	12,710	221,184	35,388
Thread ....*lb.*	44,671	32,541	84,385	63,666
Gutta percha manufactures.*lb.*	38,325	12,644	169,312	53,068
Other rubber manufactures..	.....	89,826	.....	286,797
Totals	.....	$2,320,843	.....	$6,328,634

Rubber Questionnaire

First Quarter, 1938*

	Long Tons			
RECLAIMED RUBBER	Inventory at End of Quarter	Production	Shipments	Consumption
Reclaimers solely (6).....	7,643	8,641	8,412	....
Manufacturers who also reclaim (16)..	6,459	6,178	891	7,865
Other manufacturers (105).....	7,114	....	....	8,254
Totals	21,216	14,819	9,303	16,119

	Long Tons		
SCRAP RUBBER	Inventory	Consumption	Due on Contracts
Reclaimers solely (6).....	51,387	10,178	3,601
Manufacturers who also reclaim (15)....	49,032	7,040	3,800
Other manufacturers (13).....	220	....	....
Totals	100,639	17,218	7,401

Tons of Rubber Consumed in Rubber Products and Total Sales Value of Shipments

PRODUCTS	Rubber Consumed Long Tons	Total Sales Value of Shipments of Manufactured Rubber Products
Tires and Tire Sundries		
All types pneumatic casings (except bicycle, airplane)	40,209	$50,587,000
All types pneumatic tubes (except bicycle, airplane)	5,939	6,954,000
Bicycle tires, including juvenile pneumatics (single tubes, casings, and tubes).....	182	511,000
Airplane tires and tubes.....	39	178,000
Solid and cushion tires for highway transportation	68	47,000
All other solid and cushion tires.....	39	276,000
Tire sundries and repair materials.....	1,332	1,831,000
Totals	47,808	$60,384,000
Other Rubber Products		
Mechanical rubber goods.....	5,855	$20,418,000
Boots and shoes.....	2,861	8,725,000
Insulated wire and cable compounds.....	1,002	†
Druggists' sundries, medical and surgical rubber goods	637	1,945,000
Stationers' rubber goods.....	386	546,000
Bathing apparel	164	370,000
Miscellaneous rubber sundries.....	431	1,067,000
Rubber clothing.....	84	385,000
Automobile fabrics.....	186	249,000
Other rubberized fabrics.....	778	1,905,000
Hard rubber goods.....	415	1,683,000
Heels and soles.....	2,193	3,712,000
Rubber flooring	182	398,000
Sponge rubber	489	763,000
Sporting goods, toys, and novelties.....	435	1,254,000
Totals	16,096	$43,420,000
Grand totals—all products.....	63,904	$103,804,000

Inventory of Rubber in the United States and Afloat

	Long Tons	
	Crude Rubber on Hand	Crude Rubber Afloat
Manufacturers	140,993	6,158
Importers and dealers.....	112,974	32,902
Totals	253,967	39,060

*Number of rubber manufacturers that reported data was 178; crude rubber importers and dealers, 43; reclaimers (solely), 6; total daily average number of employes (reporting manufacturers and reclaimers), 119,434.

It is estimated that the reported grand total crude rubber consumption is 76.3%; grand total sales value, 80%; the grand total crude rubber inventory, 84.9%; afloat figures, unavailable; the reclaimed rubber production, 71.3%; reclaimed consumption, 71.5%; and reclaimed inventory, 83.4% of the total of the entire industry.

†Owing to the difficulty of securing representative sales figures this item has been discontinued.

Compiled from statistics supplied by The Rubber Manufacturers Association, Inc.

Imports by Customs Districts

	April, 1938....		April, 1937	
	*Crude Rubber		*Crude Rubber	
	Pounds	Value	Pounds	Value
Massachusetts	5,222,963	$816,939	11,258,495	$2,068,890
New York	52,693,149	7,051,880	59,053,256	11,661,800
Philadelphia	1,341,980	205,596	2,685,182	507,884
Maryland	1,382,639	188,390	1,834,353	340,577
Virginia	336,000	44,720	.....	.....
Mobile	427,561	54,536	.....	.....
New Orleans	6,671,729	909,997	2,632,242	490,651
Galveston	22,455	3,312	.....	.....
Los Angeles	2,901,524	412,479	18,515,247	3,460,851
San Francisco	632,200	92,878	494,209	85,080
Oregon	17,920	2,688	38,080	6,741
Michigan	.....	.....	3,149	770
Chicago	.....	.....	740	104
Ohio	297,623	58,174	64,070	12,993
Totals	71,947,743	$9,841,589	96,579,023	$18,636,341

*Crude rubber including latex dry rubber content.